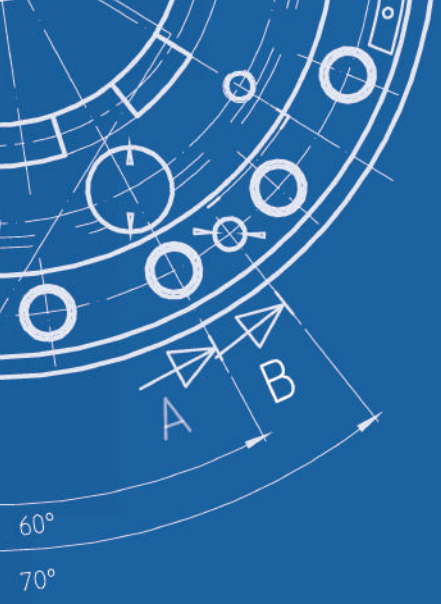
ESCOGEAR
N series

EXPERTISE DRIVEN | **CUSTOMER** FOCUSED | **SUSTAINABLE** THINKERS



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We connect the world

We are more than a 75 years old family-owned company specialized in designing and manufacturing high-quality custom-made power transmission products.

Because we believe each transmission challenge is different, we create much more than off-the shelf products: we work hand in hand with our customers to develop the coupling solutions that best fit their specific needs.

Superior product quality is what guarantees our customer's success, it is what enables us to cherish long term partnerships with them. The ESCO quality has been worldly renown for decades and we work tirelessly to raise these standards even further.

We strive to be a significant contributor to the development of effective and clean industrial, transportation and energy supply applications. We want our couplings to power a more sustainable world.
We strongly believe that both the future of our economy and the best guarantee for long term return lie in sustainable development. And we want to do our part.

Once we get involved into a specific sector, we make sure to embrace the quality standards that the market requires. This is why, we are ISO 9001 certified.

CERTIFIED ISO 9001:2015 COMPANY

A global footprint, with a family of 9 companies located all across the world

9 offices across the world

3 manufacturing sites

ESCO Couplings SRL
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We work with you to design the right solution for your application

Versatility, robustness, efficiency and long life, these are only a few of the many high demands on the gear couplings. These properties are the reason why gear couplings are that popular in multiple industries as they can get along with all different harsh conditions.

Since the competitiveness of the technical and economic aspects of the production needs to be more and more effective in the long-term, the machines used in the applications need to be able to run continuously, without failure. Furthermore, maintenance operations should be as short and seamless as possible to minimize costly production down time.

Minimizing the life cycle cost of the iinstallation requires careful attention when selecting the elements of the driveline. A high-quality coupling will make a difference between an efficient, cost effective transmission, and a poorly optimizez one.

This is where ESCO can help you. We have been helping our customers by designing high-quality tailor-made couplings for more than 40 years:

Quality is our moto, our core competency: ESCO products are amongst the most reliable in the market; so much so that the main hurdle in our capacity to innovate is the lack of market feedback: our couplings just keep running without issues.

Low lifecycle cost might well be the biggest challenge for ESCO to tackle, but we do work tirelessly to optimize the life time value of our couplings: fair initial price, smaller footprint (space and weight), longer design life, lubrification-free alternatives, extended maintenance steps...

Service is an important part of our business: to best serve your needs, you can count on our experienced team and advanced testing capability. We are more than happy to assist in performing field interventions, maintenance and repair.

Our relationship with customers does not stop once couplings are delivered. We have a team of experienced people ready to perform service on the field, repair, inspections, testing... We can also do the maintenance on our couplings for you. This guarantees proper execution of the maintenance instructions and contributes to improving the lifetime of your application.

ESCO specializes in the design of custom made couplings. If you cannot find a solution that fits your needs, please contact us: we will work hard to engineer the coupling that fits your application specifications.

Why ESCOGEAR N?

Improves efficiency of machine design and coupling selection

High torque and misalignment capacity – Compact design

Thanks to the patented ESCOGEAR Multicrown profile (used on the N series), the optimised coupling design and the standard use of 12.9 quality bolts, the ESCOGEAR couplings offer the user a very high torque capacity. This means that for a given torque a smaller coupling can be used which results in more efficient machine design and performance. Furthermore, this high torque is available at important angular misalignment.

Torque capacity independent from misalignment – Transparent coupling selection

The torque capacity of a gear type coupling strongly depends on the angular misalignment to which it is subjected: the higher the misalignment, the lower the torque capacity. It is clear that this relationship can and will cause problems in coupling selection because misalignment during operation is almost impossible to predict. ESCOGEAR couplings of the N types are equipped with the ESCO Multicrown tooth form. Thanks to this quite unique design, the ESCOGEAR has a torque capacity that is practically independent of the angular misalignment. Therefore, coupling selection is easy and mistakes are avoided: long coupling life is guaranteed.

Extends installation lifetime

High precision gearing – Higher quality, more reliable coupling

Pitch error in the gearing of coupling can strongly affect the load distribution between the teeth can be strongly influenced. In some cases, the maximum load applied on the teeth can be twice the value of the load calculated. The consequence will be higher surface and root stresses and coupling failure might be the result. Thanks to the high precision manufacturing process and equipment on which all ESCOGEAR couplings are manufactured and the sophisticated quality control, pitch error is minimized and the best possible gear quality level and life time can be guaranteed.

Reduced backlash – Reduced load during start/stop and reverse torque applications

Due to the Multicrown design necessary backlash between the teeth can be reduced to an absolute minimum. This will reduce the impact loads in start/stop and reserve torque applications. As a result, the teeth can be designed with a larger profile and the root stresses will be reduced. Thanks to this feature the ESCOGEAR couplings are ideal for use in presses, mills, punching machines, portal cranes, pumps, conveyors etc...

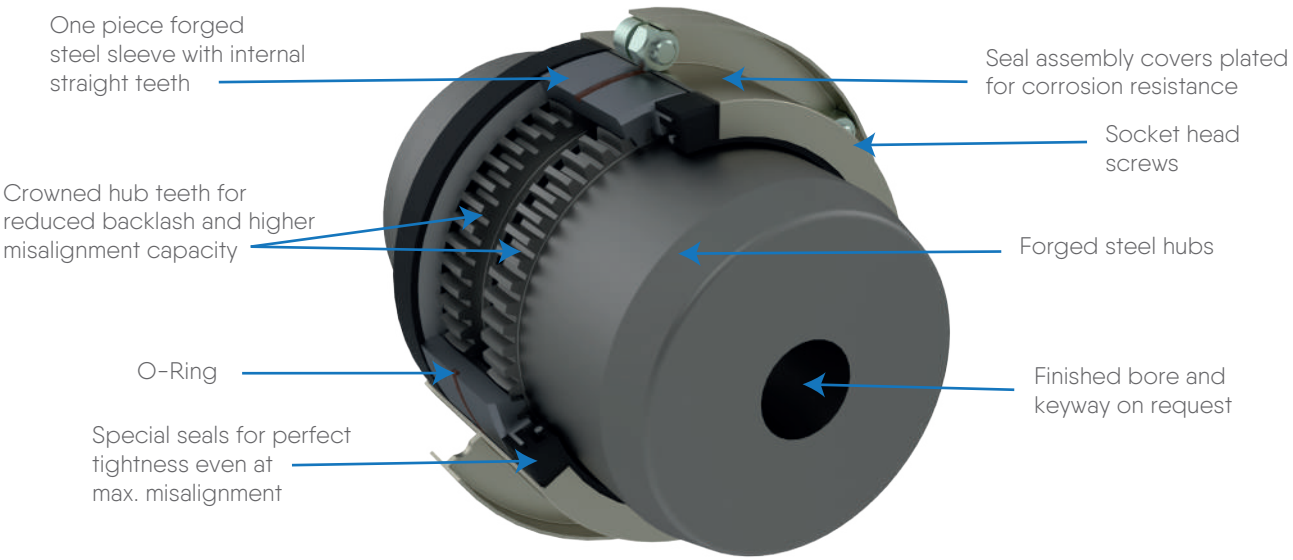
Perfect gear top centering – Reduced vibrations

Gear type couplings require, in order to operate, a “clearance” between the top of each hub tooth and the root of the sleeve teeth. Due to this clearance, the sleeve cannot be perfectly centred on the hubs. This will create vibrations in applications where the load constantly changes from no load to full load (e.g. portal cranes). These vibrations will of course influence the operation of the connected equipment. Thanks to special design and machining techniques, ESCO is able to pilot the top of each hub tooth into the root of the sleeve teeth. By doing so, the sleeve will remain perfectly centred on the hub and vibrations will be avoided. This specific feature is standard on all N couplings.

Special surface treatment and coating – Excellent protection of components

In order to guarantee optimum operation, all ESCOGEAR couplings are protected with special surface treatment or coating. All bolts are coated with Geomet and the nuts are zinc plated which gives an excellent corrosion resistance and makes disassembly possible, even after numerous years of service life. Furthermore, all the steel components are protected with a special coating to improve their corrosion resistance.

NST



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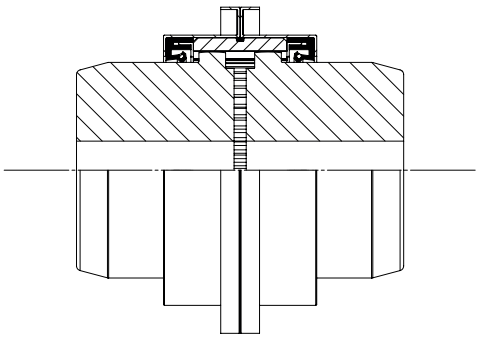
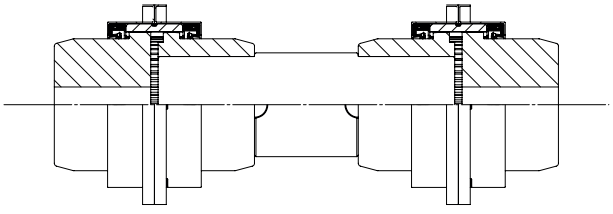
Availabilities

ESCO proposes a range of couplings available with Exposed Metric (EM)



NST
STANDARD
B2100a
Page 14



NFS
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B2111a
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How to select the right coupling size

Coupling size selection

To be sure to select the right ESCOGEAR N coupling for your application, it is necessary to know the following preliminary data:

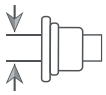
- The shaft diameter
- The type of driving machine
- The type of driven machine
- The duration and type of the daily service
- The application peak torque
- The presence of shocks or very high load peaks

To select the right ESCOGEAR N coupling size, please follow these steps:

① 

Calculate the required torque capacity by using this formula: $T = \frac{(9550 \times P \times F_u \times F_{Ex})}{n}$:with

a. P = power in kW
b. n = speed in rpm
c. F_u = service factor according to the application (see TABLE 1).
d. F_{Ex} = 2 in case of use in potentionally explosive atmospheres, European Directive 94/9/EC. In normal atmospheres, F_{Ex} = 1.

② 

Select the size of ESCOGEAR N coupling that will accommodate the largest shaft diameter (see Technical data tables, Ød max. = Maximum possible bore).

③ 

Make sure the selected coupling has an equal or greater torque capacity than the result figure obtained in ①. If it is not the case to be used, please select a larger size coupling.

- Check if the application peak torque does not exceed the chosen coupling peak torque (see Technical data tables, Tp = Maximum peak torque).
- Check the maximum allowable misalignment using the graph of (see TABLE 2).
- Check if the shaft/hub connection will transmit the torque. If necessary, select a longer hub.

④ 

Read carefully the Assembly and Maintenance Instructions IM/B200a.

Table 1: Service factor (F_u)

For ATEX applications the minimum Service factor (F_u) should be 2.00 independently of the below given values

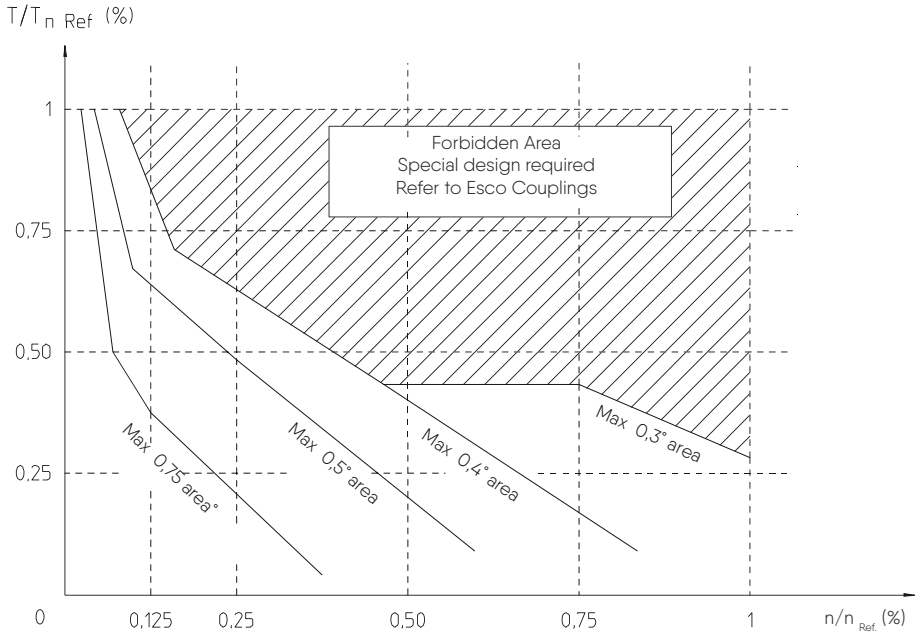
Applications			DRIVER MACHINE		
			Electric motors & Turbines	Hydraulic motors & Gears drivers	Reciprocating engine & Electric motors frequent starts
			Service Factor *Fu*		
DRIVER MACHINE	UNIFORM	Generators - Blowers: centrifugal vanes, fans - Centrifugal pumps & compressors - Machine tools: auxiliary drives - Conveyors: belt and chain, uniformly loaded, escalators - Can filling machines & bottling machinery - Agitators: pure liquids	0,8 to 1,25	1 to 1,5	1,25 to 1,75
		Propellers - Waterjet pumps	1,25	1,5	1,75
	MODERATE SHOCKS	Blowers: lobe - Pumps: gear and lobe types - Vane compressors - Machine tools: main drives - Conveyors: belt & chain not uniformly fed bucket & screw - Elevators, cranes, tackles & winches - Wire winding machines, reels, winders (paper industry) - Agitators: liquids and solids, liquids of variable density	1,25 to 1,5	1,5 to 1,75	1,75 to 2
	HEAVY SHOCKS	Generators (welding) - Reciprocating pumps & compressors - Laundry washers - Bending roll, punch press, tapping machines - Barkers, calanders, paper presses Briquetter machines, cement furnace - Crushers: ore & stone, hammer mill, rubber mill - Metal mills: forming machines, table conveyors - Draw bench, wiredrawing & flattening machines - Road & railroad equipment	1,5 to 2	1,75 to 2,25	2 to 2,5

A131a

1) Maximum misalignment

Table 2:
NST

NST Size	Tn Ref kNm	Tn Ref Ex kNm	n Ref min^{-1}
25	200	100	21 500
38	450	225	16 000
45	800	400	13 800
65	2 000	1 000	10 200



How to use this graph (Tn)?

Maximum torque, maximum speed and maximum misalignment may not occur simultaneously.

1. Calculate Tn (nominal torque) and Tp (peak torque) and select coupling size.
2. Calculate Tn / Tn Ref and n/n Ref and plot the resulting point in the graph.
3. If the resulting point is located in the white area, a standard coupling may be used as far as maximum misalignment does not exceed the minimum misalignment indicated in the graph.
4. If the resulting point is located in the shaded area, please refer to ESCO Couplings.
5. In case of use in potentially explosive atmospheres Ex, proceed with the same way but using Tn Ref Ex for the calculation. Maximum misalignment may not exceed 0.5° per gear mesh.

A132a

2) Minimum misalignment:

To ensure proper gear lubrication = ΔK_w min = 0.1°

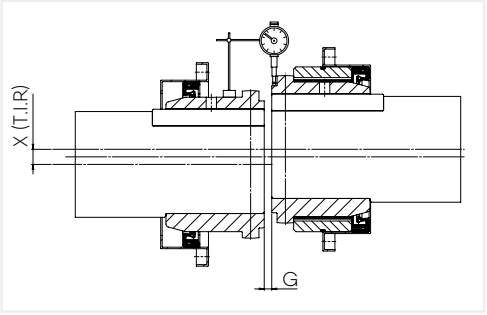
3) Misalignment control:

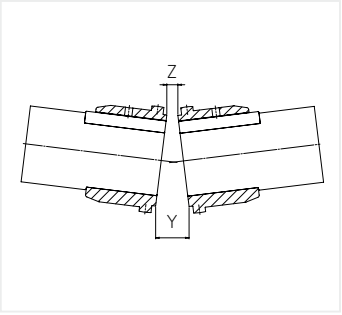
a) Measure X (Total Indicator Readout - TIR)

b) Measure Y - Z

c) Verify the relationship for the misalignment control:

$$\Delta K_w \text{ min} \leq \frac{X}{K_X} + \frac{Y - Z}{K_Y} \leq 0.75 \times \Delta K_w \text{ max}$$





4) Examples:

- Example of calculation:
  T/Tn ref = 30%
  n/n ref = 30%
  } ΔK_w max = 0.4°
  NST 45: Kx = 0.7 Ky = 2.23
- Example of measurement:
  X (TIR) = 0.1 mm Y-Z = 0.25 mm

- Example of control:

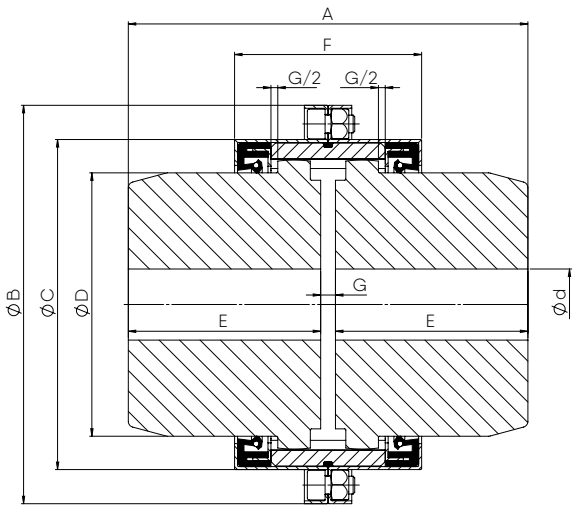
  Formula: $\Delta K_w \text{ min} \leq \frac{X}{K_X} + \frac{Y - Z}{K_Y} \leq 0.75 \times \Delta K_w \text{ max}$

  Calculation: $0.1^0 \leq \frac{0.1}{0.7} + \frac{0.25}{2.23} \leq 0.75 \times 0.25$

NST Size	K_{XO}	K_{YO}
25	0.45	1.4
38	0.56	1.88
45	0.7	2.23
65	0.8	3.11

NST
STANDARD
25 ➢ 65

B2100a



size	torque NST		n	Ød	Ød	A	ØB	ØC	ØD	E	F	G	weight	Inertia	max. misalignment		
	nominal	peak	max.	min. (1)	max. (2)								(3)	J (3)	angular	radial	axial (±)
NST	kNm	kNm	rpm	dimensions in mm									kg	kgm²	degree	mm	mm
25	0.2	0.4	6 300	0	25	58	76.5	57.5	40	27	42	4	0.85	0.0004	2x0.75	0.10	4
38	0.45	0.9	4 800	0	38	75	94	74.5	54	35	48	5	1.81	0.0013	2x0.75	0.11	5
45	0.8	1.6	4 100	0	45	95	109	86	64	45	55	5	2.97	0.0026	2x0.75	0.13	5
65	2	4	3 000	26	65	135	134.5	111.5	89	65	63	5	7.23	0.0102	2x0.75	0.15	5

(1) Min. finish machine bore diameter (size ≥ 65)

(2) Max. bore diameter with one keyway acc. DIN 6885/1

(3) For pre-bored/unbored hubs

- Couplings can be supplied with several options (e.g. puller holes, set screws, ATEX)
  → refer to page 17 et seqq. (B202a et seqq.)
- For the correct coupling selection please refer to page 12 et seqq. (A130a)
- For special executions or requirements, please contact us
- Technical modifications reserved and given values without engagement

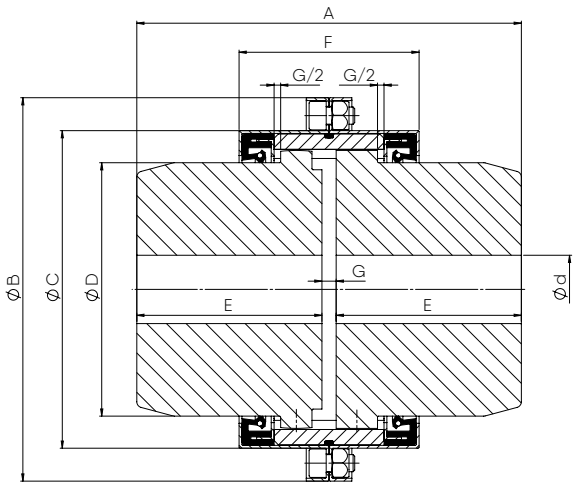
esco

NFS

FLOATING SHAFT

25 ➢ 65

B2110a



size	torque NFS		n	Ød	Ød	A	ØB	ØC	ØD	E	F	G	Inertia	max. misalignment	
	nominal Tn	peak Tp	max.	min. (1)	max. (2)								J (3)	angular	axial
NFS	kNm	kNm	rpm	dimensions in mm									kgm^2	degree	mm
25	0.2	0.4	6 300	0	25	58	76.5	57.5	40	27	42	4	0.0004	0.75	4
38	0.45	0.9	4 800	0	38	75	94	74.5	54	35	48	5	0.0013	0.75	5
45	0.8	1.6	4 100	0	45	95	109	86	64	45	55	5	0.0026	0.75	5
65	2	4	3 000	26	65	135	134.5	111.5	89	65	63	5	0.0102	0.75	5

(1) Min. finish machine bore diameter (size ≥ 65)

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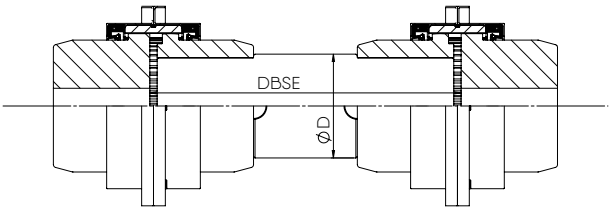
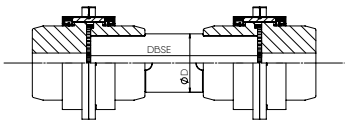
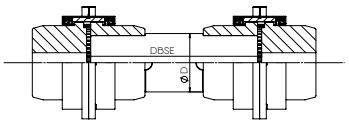
NFS
FLOATING SHAFT ASSEMBLY
25 ➢ 65

B2111a





FRRF assembly



RFFR assembly

Size	øD (1)	Max speed fonction DBSE									
NFS	mm	500	600	800	1 000	1 500	2 500	4 000	5 000	6 000	7 000
25	18	6 300	5 708	3 033	1 877	799	278				
38	25	4 800	4 800	4 426	2 710	1 138	392	149			
45	32	4 100	4 100	4 100	3 625	1 498	510	193			
65	45	3 000	3 000	3 000	3 000	2 233	741	277			

(1) Diameter D, based on double keyway transmissions, can be adapted depending on application data.

- Couplings can be supplied with several options (e.g. puller holes, set screws, ATEX)
  → refer to page 17 et seqq. (B202a et seqq.)
- For the correct coupling selection please refer to page 12 et seqq. (A130a)
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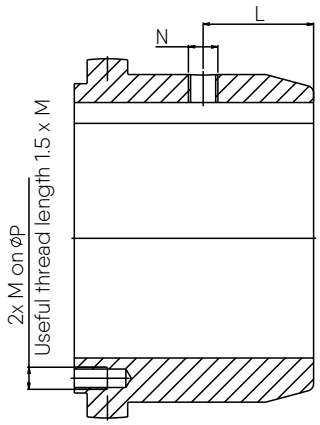
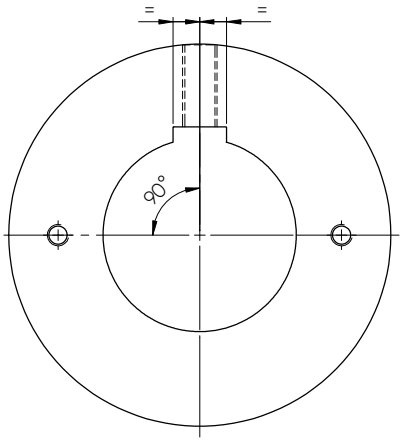
Further details

Puller holes and set screw

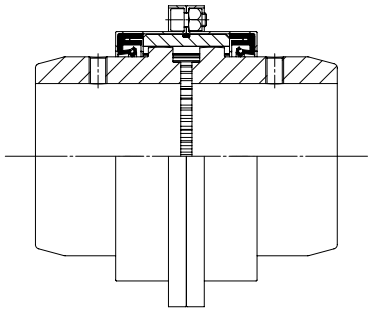
all ESCOGEAR



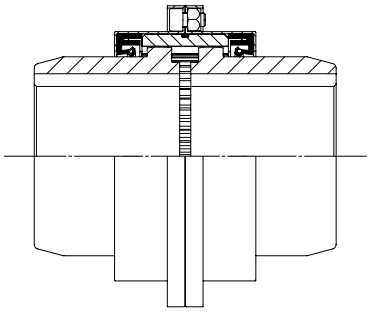


SIZE	Puller holes (mm)		Set screw (mm)	
	M	P	L	N
25	-	-	10	M5x5
38	-	-	12	M5x5
45	M5	54	16	M6x6
65	M6	76	30	M8x8

Shaft connection



BORE



KEYWAY

Protection

Fitted bolts and screws are GEOMET 500 coated and nuts zinc plated.
Additional special paintings can be done on request.

Installation and maintenance N series

1) Introduction

Coupling must be properly selected according to selection chart on page A150a and corresponding charts. These documents are available in coupling catalogue ESCOGEAR N series or on our website www.escogroup.com.

Maximum misalignment figures during assembly and operations are given in above-cited document (values used in section 4 Assembly). Maximum misalignment, speed and torque may not be applied simultaneously as menitoned in the selection chart.

In case of any change or adaptation not performed by ESCO on the coupling, it is customers responsibility to size and manufacture it properly to guarantee safe torque transmission and absence of unbalance that could affect the life of the coupling and the connected machines.

If the interfaces are not calculated and machined by ESCO, it is customers responsibility to make sure that:

- In case of key
  - Shaft and key material, size and tolerance to suit the application
  - Hub length, bore diameter and machining tolerances will allow to transmit the torque; maximum bore capacity is given for information in the catalogue for DIN 6885/1 or NF E22-175.
- In case of interference fit
  - Interference and machining tolerances will transmit the torque and not exceed the permissible stress of hub material.

In case of spacer or floating shaft not supplied by ESCO, it is customer's responsibility to size and manufacture it properly to guarantee safe torque transmission and absence of unbalance that could affect the life of gearing an the connected machines.

The hubs must be axially secured on the shaft by means of either a setscrew or an end plate or a sufficient interference. It is customers responsibility to protect the coupling and to comply with the local safety rules regarding the protection of rotating parts.

e.g.: coupling guards

2) Preparation

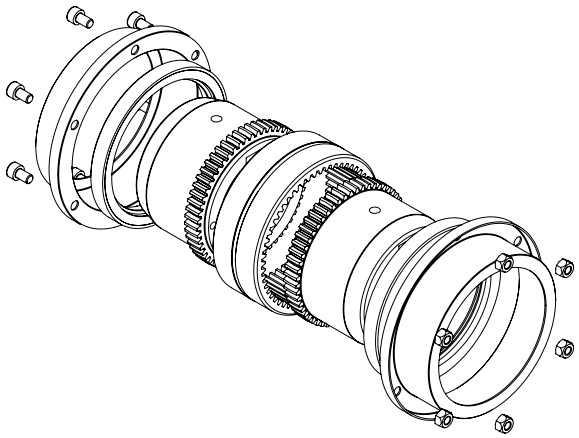
Ensure the conformity of the supplied equipment:

- Verify coupling size and conformity (see catalogue or website)
- Check for any damaged and/or missing parts
- Verify conformity of the coupling/machine interfaces
- Coupling original protection allows for storage indoors dry 18 months, indoors humid 12 months, outdoors covered 9 months and outdoors open 3 months. For longer periods, it is customers responsibility to protect the parts properly.
- Instructions are a part of the supply of the coupling. Be sure that valid and complete Assembly, operation and maintenance instructions are available and well understood. In case of doubt, refer to ESCO.

Before starting, verify the availability of the necessary tooling to:

- Manipulate the parts.
- Assemble the interfaces.
- Align the coupling.
- Tighten the screws and nuts.

Assembly, disassembly and maintenance must be performed by qualified, trained and competent fitters.



3) Warnings

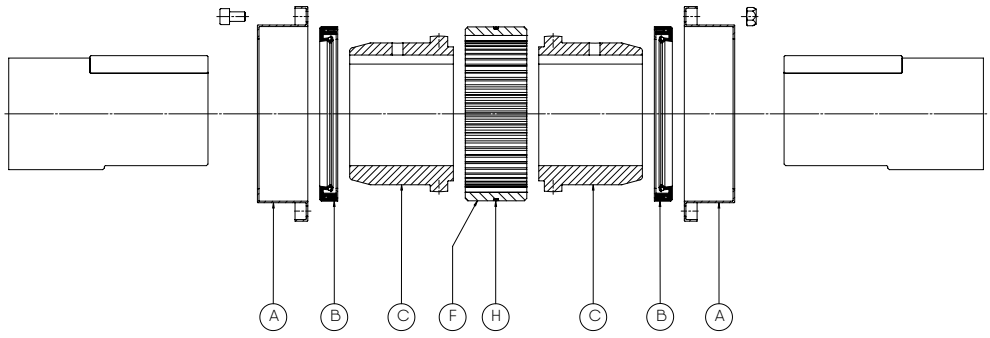
In-charge installer and plan foreman are responsible of the installation safety. All adequate safety rules must be put in place for the assembly process.

Before removing the coupling guard and proceeding with any assembly, operation or maintenance operation of the coupling, make sure the complete system is completely shut down and definitively disengaged from any possible source of rotation, such as e.g.: electrical power supply or any loss of braking effect.

Make sure everyone present in the equipment area will be properly informed (for example by means of warnings properly located) about the maintenance or assembly situation. In case of use in explosive atmospheres ⟨εx⟩ specific protective measures must be considered.
They are described in an extra attachment (IM/B200a-EX) to the instructions with the couplings marked ⟨εx⟩.

4) Assembly NST couplings

4.1. NST couplings



4.1.1. Ensure all parts are clean.

4.1.2. Apply a light coat of grease to the seals (B) already mounted in covers (A) and to O-Ring (H) and slide the O-Ring (H) over sleeve (F).

4.1.3. Place covers (A) with their seals (B) over shaft ends. Care should be taken not to damage seals (B).

4.1.4. Install hubs (C) on their respective shafts. If needed, for keyway assembly, uniformity heat hubs (C) (max 120°C) to them easily on the shaft, in this case, avoid any contact between the hub (C) and seal (B). Hub faces must be flush with shaft end. In case of doubt, please consult us. Introduce setscrew on key with Loctite and tighten properly. In case of Interference fit, refer to ESCO for proper instructions.

4.1.5. Engage sleeve (F) on the longest shaft end.

4.1.6. Install units to be connected in place and check with a gauge of thickness (D) if the spacing G between the two machines is the same as mentioned in tabulation 1 or in the approved drawing. In case of doubt, please contact ESCO.

4.1.7. Align the two shafts check alignment using an indicator. Alignment precision depends on running speed (see tabulation 2).

4.1.8. Coat hub and sleeve gearings with grease. For quantity and quality of grease, see tabulation 3.

4.1.9. Engage sleeve (F) its O-Ring (H) over the hubs. Slide covers (A) with their seals (B) over sleeve (F). Bolt covers (A) together. See tabulation 1 for tightening torque T and key size s.

5) Inspection and maintenance

5.1. Inspection

Regular inspection (audio-visual) must occur for leakage, noise, vibration, and loss of parts.

5.2. Maintenance

5.2.1. Every 4 000 hours or every year:

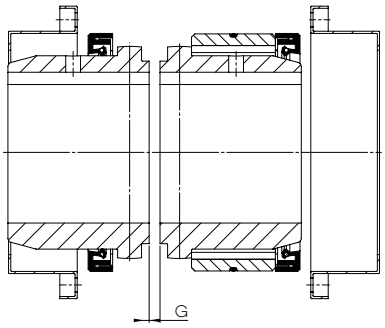
- Remove bolts from covers (A)
- Slide covers (A) and sleeve (F) from the hubs (C)
- Completely refill up with grease gear teeth and space (K) between hubs: Proceed as mentioned under 4.1.9.
- Reassemble sleeve (F) and covers (A).

Every 8 000 hours or every 2 years:

5.2.2.
- Remove bolts from covers (A).
- Control gearing and sealing.
- Control alignment; see point 4.1.6.
- Reassemble coupling as per point 4.

6) Tabulation and figures

TABULATION 1				
SIZE	G	T	Hexagonal socket head screw	
	mm	Nm	M	s
25	4	8	5	4
38	5	8	5	4
45	5	13	6	5
65	5	13	6	5



NST

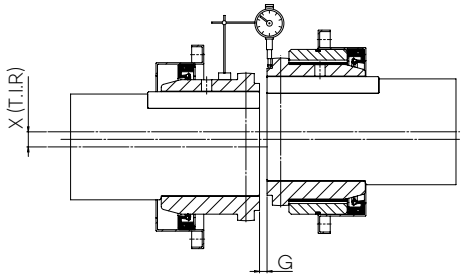
TABULATION 2 – ALIGNMENT PRECISION									
NST Size	N = 250		N = 500		N = 1 000	N = 2 000		N = 4 000	
	X	Y-Z	X	Y-Z	Y-Z	X	Y-Z	X	Y-Z
25 to 65	0.100	0.25	0.075	0.20	0.15	0.040	0.15	0.025	0.15

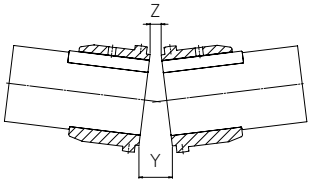
a) Measure X (Total Indicator Readout – TIR)

b) Measure Y – Z

c) Verify the relationship for the misalignment control:

$$\Delta K_w \text{ min} \leq \frac{X}{K_X} + \frac{Y - Z}{K_Y} \leq 0.75 \times \Delta K_w \text{ max}$$





TABULATION 3 – RECOMMENDED LUBRICANTS AND QUANTITY				Type	NST dm³	NFS dm³
NORMAL SPEED AND DUTY		HIGH SPEED, HEAVY DUTY AND ATEX				
Molykote	Molykote BR 2	Caltex	Coupling Grease	25	0.01	2x0.01
Molyduval	Molyduval "S"	Klüber	Klüberplex GE 11-680	38	0.02	2x0.02
Molub-Alloy	Moulb-Alloy HD 777	Mobil	Mobilgrease XTC	45	0.03	2x0.03
Caltex	Coupling Grease	Shell	Albida GC1	65	0.05	2x0.05
Klüber	Structovis PO0 / Klüberplex GE 11-680	Texaco	Coupling Grease			
Mobil	Mobilgrease XTC					
Shell	Albida GC1					
Texaco	Coupling Grease					

Notes:

ATEX

Specific protective measures taken for ESCOGEAR couplings in case of use in explosive atmospheres.

1) Introduction

General assembly and maintenance instructions (called IM in this attachment) are established for standard ESCOGEAR couplings according to the following list:

- IM/B200a for ESCOGEAR NST couplings
- IM/B300a for ESCOGEAR CST couplings
- IM/B400a for ESCOGEAR FST couplings

In case of use in potentially explosive atmospheres, further to the general assembly and maintenance instructions (IM/...), the specific measures described in this attachment must be taken.

2) Coupling Selection

The coupling must be selected according to the general assembly and maintenance instruction IM/...

In explosive atmosphere ⟨Ex⟩, the following specific rules must apply:

- A Service Factor of 2 must be applied on the max. torque values given in the charts in catalogue (see Selection chart A150ff.).
- A Service Factor of 2 must be applied on the reference torque values given on the selection chart A150a for the calculation of max. misalignment in operation.
- Max. misalignment (combination of angular and offset) may not exceed 0.5° per gear mesh.

3) Use of the coupling

The coupling is dedicated to be used in potentially explosive atmospheres according to European Directive 2014/34/EU (ATEX 100A).

Coupling is classified in equipment group II, equipment category 2 and 3, intended to be used in areas in which explosive atmospheres caused by gases, vapours, mists of air/dust mixtures are likely to occur.

In function of the ambient temperature in the coupling proximity (65, 55, 40°C), the temperature classes have been defined (T4, T5, T6).

This is based on a temperature increase of the machine shafts (in regard of the ambient temperature) that will not exceed 40°C in operation.

The coupling is marked as follows:

CE ⟨Ex⟩ II 2 G T4/T5/T6 D 105°C
-20°C ≤ Ta ≤ 65°C/55°C/40°C

This marking covers the T3 temperature category.

This marking covers all gas categories: G IIA, G IIB and G IIC.

4) Warnings

The warnings mentioned in the general assembly and maintenance instructions IM/... must apply in any case.

In explosive atmospheres ⟨Ex⟩, the following specific warnings must apply:

- Complete machining of the coupling parts (bores, keyways, spacers, floating shafts etc...) must be performed by ESCO Couplings SRL. No modification shall be made on the supplied and marked product without the agreement of ESCO Couplings SRL.
- In case of supply by ESCO Couplings SRL of couplings with a rough bore or a solid bore, the sole allowed operation that may be performed by customer is the boring and keywaying of the coupling hubs.

When machining the bore and the keyway, the following instructions must be followed:

- This job must be performed by an authorised and adequately trained and informed operator.
- The bore and keyway tolerances must be selected to ensure the proper fit between shaft and bore. In case of loose fit, a set screw must be foreseen to locate the hub axially.
- The max. bore may not exceed the value stated in the catalogue. The tabulated values in the catalogue are based on key dimensions according to ISO R773.
- The reference used to center the piece when boring, is the one referenced D in the figures of the catalogue.

- Before proceeding with any assembly, operation or maintenance operation on the coupling, make sure that the necessary measures have been taken to ensure safety, such as but not limited to:
  - Proper ventilation of the area
  - Proper lightning and electrical tools.
- If hub must be heated for assembly on the shaft, make sure heating source and surface temperature will not affect the safety of the working area.

- It is recommended to have a strong coupling guard, preferably in stainless steel with openings (if any) smaller than the smallest centrifugable part (plug is 6 mm dia). The coupling guard is intended to protect the environment from the centrifugation of any rotating part and the rotating coupling from any falling part. To limit ventilation effects, distance between cover and coupling outside surface should be at least 10 mm.

5) Assembly

The general assembly and maintenance instructions IM/... must apply in any case.

In explosive atmospheres  , the following specific instructions must apply:

- Alignment of the machine in cold condition must take into account the possible heat expansion to make sure that in continuous running conditions, max. misalignment calculated in A152a will not be exceeded.
- Max. misalignment may never exceed 0.5° per gear mesh.
- To improve the coefficient of friction and the leakage resistance, use following lubricants dedicated for gear couplings:
  - CHEVRON Coupling Grease
  - CALTEX Coupling Grease
  - KLÜBER Klüberplex GE11-680
  - MOBIL Mobilgrease XTC
  - TEXACO/MULTIFAK Coupling Grease

6) Operation

The general assembly and maintenance instructions IM/... must apply in any case.

In explosive atmospheres  , the following specific instructions must apply:

- Before Start-up
  - Make sure, screws, nuts and plugs are properly tightened.
  - Coupling guard must be properly installed and fixed.
  - Monitoring system, if any, must be tested to verify its effectiveness.
- During start up
  - Check for any leakage. In case of abnormal leakage, immediate stop is mandatory and appropriate actions must be taken.
  - Check for any abnormal noise and/or vibration. If any, immediate stop is mandatory and appropriate actions must be taken.
- Checking intervals during operation
  - After the first 2 000 hours or 6 months; check:
    - For leakage, noise, vibration and loss of parts.
    - For free axial movement of the sleeves in regard of the hubs.
- After 4 000 hours or one year
    - For leakage, noise, vibration and loss of parts.
    - For free axial movement of the sleeves in regard of the hubs.
- Continuous checking
  - Immediately stop the machine if noise, vibrations or other abnormal phenomena are detected during operation.
  - Further more, if direct check is not possible for access or safety reasons, proper monitoring system has to be installed to follow up couplings behaviour.

7) Maintenance

The general assembly and maintenance instructions IM/... must apply in any case.

In explosive atmospheres  , the following specific instructions must apply:

- Every 6 000 hours or 1.5 years:
  - Dismount the coupling and inspect
  - Proceed as indicated in point 4.

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