

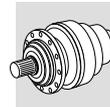
Technical Bulletin

Guidelines for selection of planetary gear units of the 300-INDUSTRIAL series for installation in hazardous areas, classified by Directive 99/92/EC

300

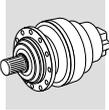


BONFIGLIOLI



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Revisions
Refer to page 14 for the catalogue revision index.
Visit www.bonfiglioli.com to search for catalogues with up-to-date revisions.



1.0 - SCOPE OF DOCUMENT

This Technical Bulletin serves as an aid for the selection of 300 series planetary gear units intended for installation in explosion risk areas, classified according to Directive 1999/92/EC.

This Technical Bulletin is an integral part of the 300-IND series catalogue, code 1900, and subsequent revisions, and has the following scope:

- describes the **constructional characteristics** of gear units conforming to the “ATEX” Directive 94/9/EC, where they differ from those of standard construction gear units - see par. 4.0.2.
- specifies the **selection criteria** approved by the Manufacturer to ensure that said gear units operate in compliance with the minimum safety requirements stipulated by Directive 94/9/EC – see par. 4.0.4.

2.0 - INTRODUCTION TO THE ATEX DIRECTIVES

Under the provisions of Directive 94/9/EC, an explosive atmosphere is defined as a mixture:

- a) of **flammable substances**, whether gas, vapour, mist or dust;
- b) with **air**;
- c) in certain **atmospheric conditions**;
- d) in which, following ignition, combustion spreads to the entire unburned mixture (note that in the case of dust, the entire quantity of dust is not always completely burnt after combustion).

An atmosphere which may potentially be transformed into an explosive atmosphere due to operating and/or ambient conditions is defined as a **potentially explosive atmosphere**. The products governed by Directive 94/9/EC are intended for use only in a potentially explosive atmosphere defined in this way.

European harmonised ATEX standards

The European Union has issued two harmonisation guidelines in the area of health and safety. Directive 94/9/EC stipulates the minimum safety requirements for products intended for use in explosion risk areas within the member countries of the European Union. The directive also assigns such equipment to **categories**, which are defined by the directive itself.

Directive 1999/92/EC defines the minimum health and safety requirements for the workplace, for working conditions and for the handling of products and materials in explosion risk areas. The directive also divides the workplace into **zones** and defines the criteria for the application of product **categories** in said zones.

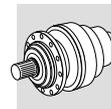
The following table describes the **zones** into which the user of a plant, in which an explosive atmosphere may occur, is required to divide the equipment application areas.

Zones		Formation frequency of a potentially explosive atmosphere	Type of danger
Gaseous atmosphere G	Dusty atmosphere D		
0	20	Present continuously or for long periods	Permanent
1	21	Likely to occur in normal operation occasionally	Potential
2	22	Not likely to occur in normal operation but if it does occur will persist for short period only	Minimal

BONFIGLIOLI RIDUTTORI gear units selected in this catalogue are suitable for installation in zones 1, 21, 2 and 22, as highlighted in grey in the above table.

As from 1 July 2003 the ATEX directives came into force throughout the entire European Union, and replace existing conflicting national and European laws on explosive atmospheres.

The directives apply to mechanical, hydraulic and pneumatic equipment.



Levels of protection for the various categories of equipment

The various categories of equipment must be able to operate in conformity with the Manufacturer's operational specifications, at certain defined levels of protection.

Protection level	Category		Type of protection	Operating conditions
	Group I	Group II		
Very high	M1		Two independent means of protection or safety capable of operating even when two independent faults occur	The equipment remains powered and operational even in the presence of an explosive atmosphere
Very high		1	Two independent means of protection or safety capable of operating even when two independent faults occur	The equipment remains powered and operational in zones 0, 1, 2 (G) and/or zones 20, 21, 22 (D)
High	M2		Protection suitable for normal operation and heavy duty conditions	Power to the equipment is shut off in the presence of a potentially explosive atmosphere
High		2	Protection suitable for normal operation and frequent faults or equipment in which malfunction is normal.	The equipment remains powered and operational in zones 1, 2 (G) and/or zones 21, 22 (D)
Normal		3	Protection suitable for normal operation	The equipment remains powered and operational in zones 2 (G) and/or 22 (D)

Definition of groups (EN 1127-1)

Group I Applies to equipment intended for use underground in parts of mines and those parts of surface installations of such mines, liable to be endangered by firedamp and/or combustible dust.

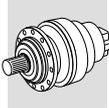
Group II Applies to equipment intended for use in other places liable to be endangered by explosive atmospheres.

The areas highlighted in grey indicate the only categories in which BONFIGLIOLI RIDUTTORI products may be used. BONFIGLIOLI RIDUTTORI products may not therefore be installed in mines, classified in **Group I**. To summarise, the classification of equipment into groups, categories and zones is illustrated in the table below, where the availability of BONFIGLIOLI RIDUTTORI products is highlighted in grey.

Group	I		II					
	mines, firedamp		other potentially explosive areas (gas, dust)					
Category	M1	M2	1		2		3	
Atmosphere ⁽¹⁾			G	D	G	D	G	D
Zone			0	20	1	21	2	22
Type of protection gear unit ⁽²⁾					c, k	c, k	c, k	c, k

(1) G = gas D = dust

(2) as per EN 13463



3.0 - USE, INSTALLATION AND MAINTENANCE



The instructions for safe storage, handling and use of the product are given in the unit's User, Installation and Service Manual.

This document must be kept in a suitable place, in the vicinity of the installed gear unit, as a reference for all persons authorised to work with or on the product throughout its service life.

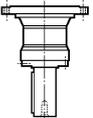
The Manufacturer reserves the right to modify, supplement or improve the Manual, in the interests of the User.

4.0 - PECULIARITIES OF 300 SERIES GEAR UNITS COMPLIANT WITH DIRECTIVE 94/9/EC

4.0.1 - PRODUCT AVAILABILITY

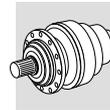
Frame sizes : 300 to 321.

	 3...L		 3...R		 3/V	
		st.		st.		st.
Configurations		L 1	-	- -	-	- -
	300...321	L 2	300...306	R 2	-	- -
	300...321	L 3	300...321	R 3	300...307	L 3
	300...321	L 4	300...321	R 4		L 4

Versions	Foot mount		Flange mount			Shaft mount	Agitator (vertical)
							
	PC	PZ	MC/HC	MZ/HZ	FZ	FP	VK

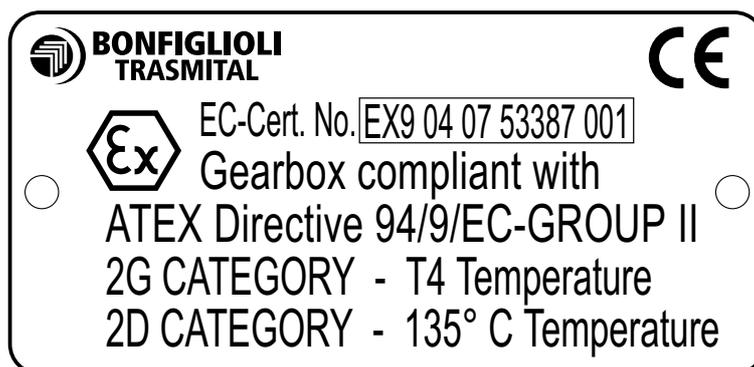
Inputs		
	P(IEC)	V_

Accessories					
	P...	B0A	M0A	G0A	W0A



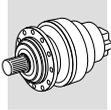
4.0.2 - CONSTRUCTIONAL CHARACTERISTICS

- Only synthetic lubricants are used.
- Only VITON® gaskets are used.
- Oil seals are equipped with dust lips.
- Vent plugs are equipped with valves with anti-intrusion springs, to prevent contamination of the lubricant by solid particles.
- Oil filler, drain and level plugs are made from steel and equipped with aluminium lock washers.
- No external metal moving parts in contact with other parts.
- No plastic parts prone to accumulating static charges; if present, such parts are shielded.
- Each gear unit is supplied with an installation drawing indicating the following information:
 - main technical characteristics
 - installation specifications
 - location of oil plugs for the specified mounting position
 - lubrication instructions
- The units are fitted with an additional nameplate specifying the product category.
For example:



4.0.3 - OPERATIONAL CHARACTERISTICS

For installation in zones 21 and 22, the Customer must set out and implement a specific cleaning schedule for the unit's surfaces and recesses to prevent build ups of dust exceeding 5 mm in depth.



4.0.4 – SELECTING THE PRODUCT

The gear unit and gearmotor selection procedure is identical to that given in the 300-IND Series catalogue, article code 1900, and any future revisions thereof.

The following chapters contain **variations** to the procedure given in the catalogue, code 1900, and subsequent revisions thereof as regards the selection of products compliant with Directive 94/9/EC, which **superse**de the procedure specified in the catalogue for units intended for installation in areas without risk of explosion.

These variations primarily affect the following:

- Application of an adjusting factor to the thermal capacity.
- Application of a service factor « f_s » with a greater safety margin.

- Thermal capacity « P_t » [kW]

This value represents the power applicable to the gear unit operating in a continuous duty cycle at an ambient temperature of 20 °C, generating a surface temperature no greater than 135 °C and with a Δt in any case no greater than 95 °C relative to the ambient temperature « t_a ».

Should the ambient temperature be different to 20 °C or the input speed « n_1 » be different to that specified in the unit's technical data charts, the value « P_t » must be recalculated using the adjusting factors for the specific conditions in question, as given in the table below:

		f_t			
t_a (°C)	Continuous duty	Intermittent duty			
		Intermittence ratio « I »			
		80%	60%	40%	20%
10	1.2	1.3	1.6	1.8	2.0
20	1.0	1.1	1.3	1.5	1.7
30	0.9	1.0	1.2	1.3	1.5
40	0.7	0.8	0.9	1.0	1.2
50	0.5	0.6	0.7	0.8	0.9

n_1 (min ⁻¹)	f_v
750	1.5
950	1.2
1500	1.0

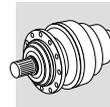
$$I = \frac{t_f}{t_f + t_r} \times 100$$

t_f = operating time under load;
 t_r = rest time.

Frame size	Configuration		reductions	f_{Ex}
	in line	right angle		
300...321	L	-	2	0.9
300...321	L	-	3 - 4	1.0
300...306	-	R	2	0.8
300...321	-	R	3 - 4	0.9

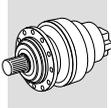
After application of the above, the following condition should be obtained:

$$P_{r1} \leq P_t \times f_t \times f_v \times f_{Ex}$$



- Service factor « f_s »

Service factor « f _s »						
Duty	Starts/hour	Accumulated operating hours (h)				
		≤ 5000	10000	15000	25000	50000
	Z	Daily operating hours (h)				
		h < 4	4 < h < 8	8 < h < 12	12 < h < 16	16 < h < 24
Uniform load	Z < 10	1.10	1.10	1.15	1.30	1.60
	10 < Z < 30	1.10	1.15	1.30	1.50	1.80
	30 < Z < 100	1.10	1.25	1.45	1.60	2.00
Moderate shock load	Z < 10	1.10	1.25	1.45	1.60	2.00
	10 < Z < 30	1.10	1.40	1.60	1.80	2.20
	30 < Z < 100	1.20	1.50	1.70	2.00	2.40
Heavy shock load	Z < 10	1.20	1.50	1.70	2.00	2.40
	10 < Z < 30	1.30	1.60	1.80	2.10	2.60
	30 < Z < 100	1.40	1.75	2.00	2.30	2.80

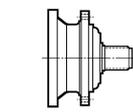


5.0 - ORDERING NUMBERS

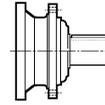
5.0.1 - DESIGNATION OF IN-LINE (300 L) AND RIGHT ANGLE (300 R) GEAR UNITS

3 11 L 2 16.7 HZ

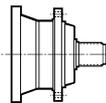
OUTPUT VERSION



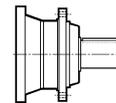
MZ: Splined male shaft



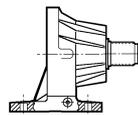
MC: Solid keyed shaft



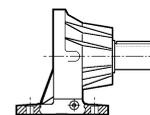
HZ: Heavy duty splined male shaft



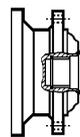
HC: Heavy duty solid keyed shaft



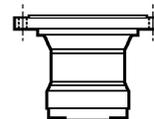
PZ: Foot mounted with splined shaft



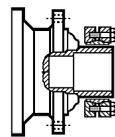
PC: Foot mounted with solid keyed shaft



FZ: Hollow splined shaft



VK: Reinforced output with large solid keyed shaft for stirrers and mixer



FP: Hollow shaft for shrink disc

GEAR RATIO

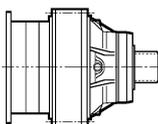
Fill in the value of the gear ratio (including point and decimals) as listed in the selection charts
Ex.: $1/44.6 = 44.6$ $1/131 = 131$

REDUCTIONS

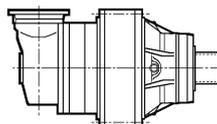
2 - 3 - 4

DESIGN

L = In line



R = Right angle



GEARBOX FRAME SIZE

00 = 300

06 = 306

11 = 311

17 = 317

01 = 301

07 = 307

13 = 313

18 = 318

03 = 303

09 = 309

15 = 315

19 = 319

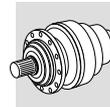
05 = 305

10 = 310

16 = 316

21 = 321

SERIES

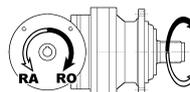


P180 A W0A EX ...

OPTIONS

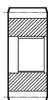
INPUT SHAFT PREFERENTIAL DIRECTION OF ROTATION
(applicable to angle gear units only)

RA = counterclockwise
RO = clockwise



CONFIGURATION COMPLIANT WITH ATEX DIRECTIVE 94/9/EC

OUTPUT FITTINGS



P... = Pinions



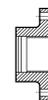
B0A = Splined bar



M0A = Sleeve coupling



G0A = Shrink disc



W0A = Flange

MOUNTING POSITION

INPUT



Input keyed shaft

VO1A = Ø 24

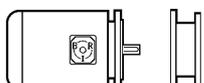
VO1B = Ø 38

VO5B = Ø 48

VO6B = Ø 60

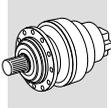
VO7B = Ø 80

V11 B = Ø 80



Electric motor connection

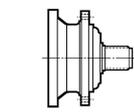
P + motor size (80,90,100,132,160,...)



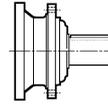
5.0.2 - DESIGNATION OF COMBINED WORM+PLANETARY (3/V) GEAR UNITS

3/V 05 L 3 623 PC

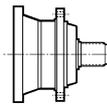
OUTPUT VERSION



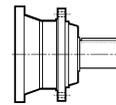
MZ: Splined male shaft



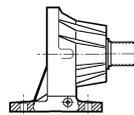
MC: Solid keyed shaft



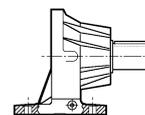
HZ: Heavy duty splined male shaft



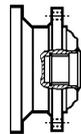
HC: Heavy duty solid keyed shaft



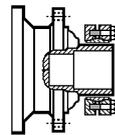
PZ: Foot mounted with splined shaft



PC: Foot mounted with solid keyed shaft



FZ: Hollow splined shaft



FP: Hollow shaft for shrink disc

GEAR RATIO

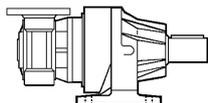
Fill in the value of the gear ratio (including point and decimals) as listed in the selection charts
Es.: 1/773 = 773

REDUCTIONS

3

DESIGN

L = Combined 300 unit, 2 planetary stages + worm gear units



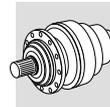
GEARBOX FRAME SIZE

00 = 3/V 00
01 = 3/V 01
03 = 3/V 03
05 = 3/V 05

06 = 3/V 06
07 = 3/V 07

SERIES

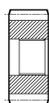
Combined 300 gearboxes / Worm gear units



P80 B5 AF W0A EX

CONFIGURATION COMPLIANT WITH ATEX DIRECTIVE 94/9/EC

OUTPUT FITTINGS



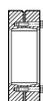
P... = Pinions



B0A = Splined bar



M0A = Sleeve coupling



G0A = Shrink disc



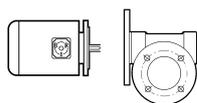
W0A = Flange

MOUNTING POSITION

MOTOR EXECUTION

B5, B14

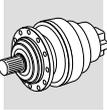
INPUT



Electric motor connection
P + motor size (80,90,100,132,160,...)



Input keyed shaft
HS



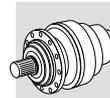
6.0 - DECLARATION OF CONFORMITY

The Declaration of Conformity, of which a copy is given in this Bulletin, attests to the conformity of the product with the provisions of Directive 94/9/EC.

Conformity is subordinated to observance of the instructions given in the User, Installation and Service Manual which specifies the safe use of the product throughout its service life.

The ambient condition specifications are of particular importance inasmuch as failure to observe them during operation renders the certificate null and void.

In case of doubt regarding the validity of the Declaration of Conformity, contact the BONFIGLIOLI RIDUTTORI Technical Service.



BONFIGLIOLI RIDUTTORI S.p.A.

Via Enrico Mattei, 12
zona Industriale Villa Selva
47100 Forlì FC Italy

P.O. BOX 7166SUCC7
Tel. +39 0543 789111
Fax + 39 0543 789242
e-mail: trasmital@bonfiglioli.com
www.bonfiglioli.com

Company Certified UNI EN ISO 9001



CERTIFICATE OF COMPLIANCE (according to EC Directive 94/9/CE Annex VIII)

BONFIGLIOLI RIDUTTORI S.p.A.

declares under its own responsibility that the following products:

- **300 INDUSTRIAL** series planetary gear units

in category **2G** and **2D** to which this certificate refers, are in compliance with the requirements of the following Directive:

94/9/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of 23 March 1994

Conformity with the provisions of this Directive is proven by complete compliance to the following Standards:

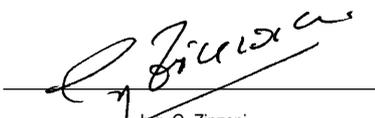
EN 1127-1, EN 13463-1, prEN 13463-5, prEN 13463-8

BONFIGLIOLI RIDUTTORI filed the documents according to 94/9/EC Annex VIII, with the following notified body:

TÜV PRODUCT SERVICE GmbH- Identification number 0123

Forlì, 27/07/2004

Place and date

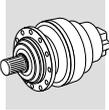

Ing. G. Zinzani
R&D Manager
MOBILE EQUIPMENT GEARED UNITS

Sede legale: Bonfiglioli Riduttori S.p.A.
Via Giovanni XXIII, 7/a
40012 Lippo di Calderara di Reno Bologna Italy

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INDEX OF REVISIONS (R)

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