

***DYNABLOC***

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**LERROY<sup>®</sup>  
SOMER**

**SERVO GEAR MOTORS**

## CONTENTS

- ❑ Presentation of the range
- ❑ Selection criteria
- ❑ Rules for selection
- ❑ Applications, LS advantages
- ❑ Organisation, Delivery times

The **DYNABLOC** range consists of low backlash and standard backlash speed reducers, combined with **UNIMOTOR** servo motors.



## *Why use a gearbox?*

- To reduce the speed of the servo motors
- To increase the torque
- To adapt the load/motor inertia ratio
- To reduce the size of the servo motor
- To optimise the cost of the drive system

## *The range*



- Helical gearbox:  
Cb Dynabloc

- Helical bevel gearbox:  
Ot Dynabloc



- Worm gearbox:  
Mb Dynabloc and Mjd Dynabloc

- Planetary gearbox:  
Pjl Dynabloc and Pjn Dynabloc



## The range

ANGULAR BACKLASH	OUTPUT SHAFT OUTLET	
	AXIAL	PERPENDICULAR
<b>STANDARD: 12 to 30'</b>	<i>Cb Dynabloc</i>	<i>Mb Dynabloc Ot Dynabloc</i>
<b>BASIC: 8 to 12'</b>	<i>&lt;400Nm Pjl Dynabloc &gt;400Nm Pjn Dynabloc</i>	<i>Mjd Dynabloc</i>
<b>MEDIUM: 3 to 5'</b>	<i>Pjn Dynabloc</i>	<i>Mjd Dynabloc</i>
<b>EXPERT: 1'</b>	<i>Pjn Dynabloc</i>	<i>Mjd Dynabloc</i>

*STANDARD backlash 12 to 30'*

## Cb Dynabloc



- Helical gears
- 5 sizes from 30 to 34
- Up to 1650 N.m
- 45 ratios from 1.25 to 200
- SMV integrated mounting
- Efficiency 98% per stage
- Cost-effective solution

*STANDARD backlash 12 to 30'*

Ot Dynabloc



- Helical bevel gears
- 4 sizes from 22 to 25
- Up to 2200 N.m
- 19 ratios from 12.5 to 125
- SMV integrated mounting
- Efficiency 95%
- Cost-effective solution
- Solid shaft outlet

*STANDARD backlash 12 to 30'*

## Mb Dynabloc



- Worm gears
- 6 sizes 31, 22, 23, 24, 25, 26
- Up to 800 N.m
- 14 ratios from 5.2 to 100
- SMV integrated mounting
- Very compact
- Cost-effective solution
- Solid or hollow shaft outlet

## *BASIC backlash 8 to 12'*

### Pjl Dynabloc



- Planetary gears
- 5 sizes 0501 to 1552
- Up to 400 N.m
- 8 ratios from 3 to 100
- High torsional rigidity
- Cost-effective low backlash range
- Compact size

*EXPERT, MEDIUM 1, 3' and BASIC 12' backlash (> 400 Nm)*

## Pjn Dynabloc



- Planetary gears
- 6 sizes 0801 to 2403
- Up to 3400 N.m
- 23 ratios from 3 to 1000
- Very high torsional rigidity
- Expansion tank option for 100% continuous duty
- Intermediate and higher reduction ratios available

## *EXPERT, MEDIUM and BASIC backlash 1, 5 et 10'*

### Mjd Dynabloc



- Worm gears
- 7 sizes 035 to 110
- Up to 900 N.m
- 9 ratios from 5.2 to 90
- Very high torsional rigidity
- Easy to integrate (a choice of 5 fixing surfaces)
- Shaft: solid, hollow keyed or smooth with shrink disc
- Very competitive in the low backlash range

## *Associated servo motors*

### UNIMOTOR

- Rated speed 3000 min<sup>-1</sup> (2000 in 190)
- Shafts adapted for **M I** in *Cb, Ot Dynabloc. Standard flanges*
- Standard shafts and flanges for Mb, Mjd, Pjl, Pjn.

## *Main criteria for selecting servo gearboxes*

- The angular backlash of the output shaft
- The torsional rigidity
- The reduction ratio
- The type and shape of the gearbox

## Positioning accuracy: ➔ Angular backlash

$$\text{Necessary backlash (min)} = \frac{\text{No. of min in one rev.}}{\text{Circumf. of pinion (mm)}} \times \text{useful accuracy (mm)}$$

### Example 1:

- ➔ Pulley  $\varnothing$  100 mm
- ➔ Accuracy = 5/100 mm

$$\text{B'lash} = \frac{360^{\circ} * 60' * 0.05}{100 * 3.14} = 3.43'$$

### Example 2:

- ➔ Pulley  $\varnothing$  60 mm
- ➔ Accuracy = 3/10 mm

$$\text{B'lash} = \frac{360^{\circ} * 60' * 0.3}{60 * 3.14} = 34'$$

## Control of the dynamics: ➔ Torsional rigidity

☐ Applications with a number of constraints:

☛ **High load inertia** ( $J_{ch}/J_m$  within permitted limit)

☛ Reduction ratio  $> 40$

☛ **Very short** accel./decel.

*Examples:*

≅ 0.1" in UNIMOTOR 75-95

≅ 0.2" in UNIMOTOR 142-190



Selection: DYNABLOC with high torsional rigidity

*Examples: Manipulation arms, articulated arms, large indexing tables, etc*

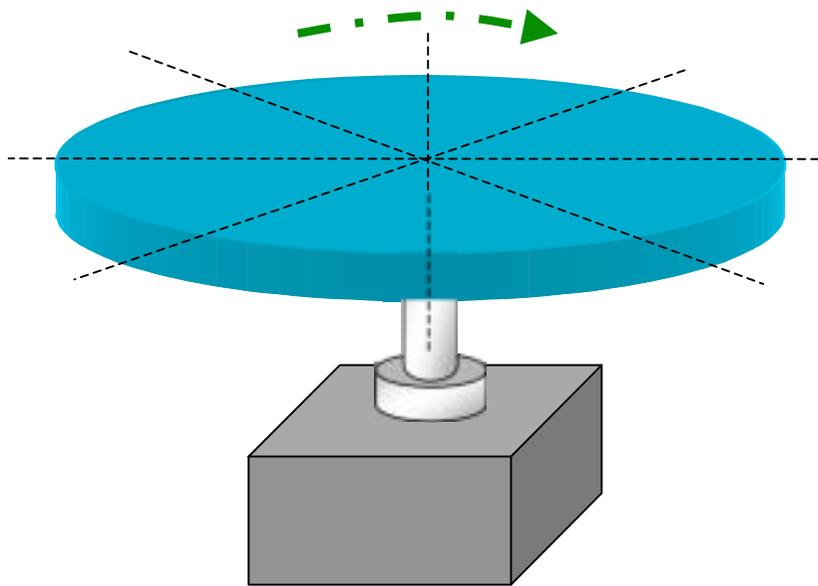
⇒ Pjl, Pjn, Mjd, Mb  
**Dynabloc**



Too much elasticity in the mechanism generates instabilities in the servo motor and prevents optimisation of the gain adjustments.

## Importance of the choice of the reduction ratio

Circular motion indexing  
tables



$$i = 1/10.5$$

Constraints:

For positioning in the same direction, a non-integer reduction ratio, between the resolution of the encoder and the output, could lead to a combination of errors.

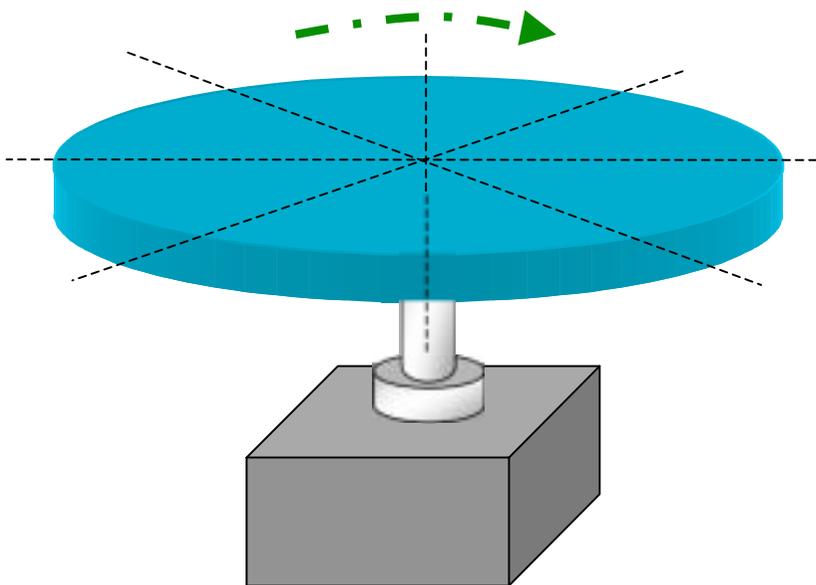
Example:

*8 positions (0.12 rev.), encoder 4096 points/motor rev, ratio 1/10.5.*

*Number of points  $n$  on motor for 0.12 rev.  
 $n = 0.12 * 10.5 * 4096 = \underline{4160.96}$  points*

## Importance of the choice of the reduction ratio

Circular motion indexing tables



$$i = 1/10.5$$

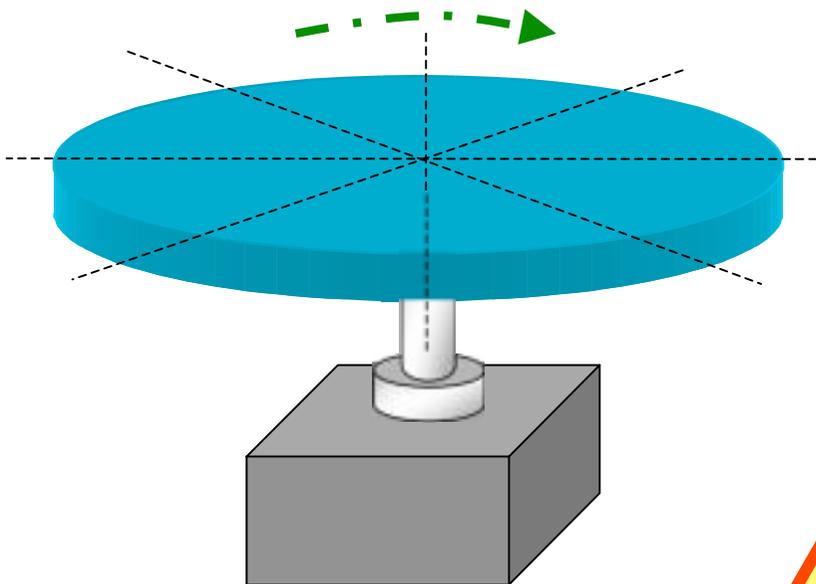
The error could be from 0.04 to 0.96 point at each stop.

- ❑ UNIDRIVE SP synchronisation and positioning application modules overcome this problem.
- ❑ For this, the reduction ratio must be entered in the form of a **fraction**.
- ❑ In the UNIDRIVE SP, the limit values of the numerator and the denominator range from 1 to 32000.

$$\frac{1 < \text{numerator} < 32000}{1 < \text{denominator} < 32000}$$

## Importance of the choice of the reduction ratio

Circular motion indexing tables



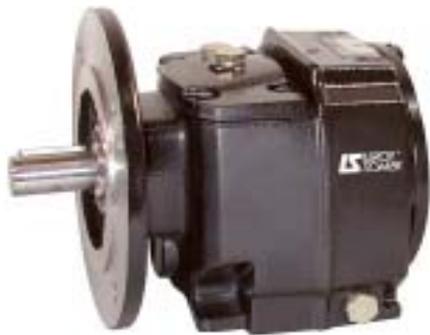
$$i = 1/10.5$$



- ❑ All the reduction ratios of the *DYNABLOC* range are given in the form of fractions (numerator/denominator) in the technical section of the documentation.
- ❑ *Dynabloc* types *Pjl*, *Pjn*, and *Mjd* have **finite** ratios.
- ❑ For the *Cb*, *Ot* and *Mb* *Dynabloc*, the finite ratios are indicated by "\*"
- ❑ In these applications, it is very important to take the transmission ratios at the gearbox output into account to complete the fraction.

Confirm the technical choices with the customer.

*Installation on the machine: ➔ Type and shape of gearbox*

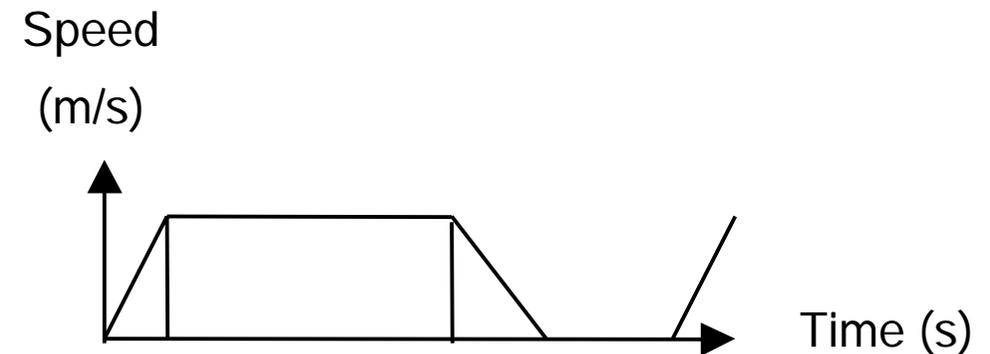


## Rules for selecting servo gearboxes



### Specifications

- Types of application:
- Displacement
  - Lifting
  - Rotation
- Weight to be driven in kg
- Speed of displacement in m/s
- Positioning accuracy
- Cycle time (see diagram)



## Rules for selecting servo gearboxes

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### Calculation of intermediate physical values

Acceleration	in m/sec <sub>²</sub>
Deceleration	in m/sec <sub>²</sub>
Speed of rotation of motor	in min <sup>-1</sup>
Total starting torque	in Nm
Braking torque	in Nm
Thermal torque	in Nm

Ratio of the load/motor moments of inertia  
The permissible ratio depends on the type of transmission and the required dynamics.

### Examples of inertia ratio J load/Jm:

- T accel = 0.1s ⇒ J load/J m ratio ≤ 3
- T accel = 0.2s ⇒ J load/J m ratio ≤ 5
- T accel = 0.5s ⇒ J load/J m ratio ≤ 8
- T accel = 1s ⇒ J load/J m ratio ≤ 15

## Rules for selecting servo gearboxes



### Determination of the servo motor

Rated speed (generally  $3000 \text{ min}^{-1}$ )  
Rated torque at rated speed ( $3000 \text{ min}^{-1}$ )  
Peak torque  
Moment of inertia

- $M_{\text{rated}} \geq M_{\text{resistive}}$  of the load
- $M_{\text{rated}} \geq M_{\text{calculated}}$  thermal
- $M_{\text{peak}} > M_{\text{total}}$  starting
- $J_{\text{load}}/J_{\text{motor}}$  according to the required dynamics (see examples)

## Rules for selecting servo gearboxes



### Determination of the gearbox

Reduction ratio of the gearbox (  $i$  )

Speed of rotation at gearbox output in  $\text{min}^{-1}$

Rated output torque (S1) in N.m

Acceleration output torque (S5) in N.m

If required, limitation of the acceleration torque of the servo motor input.

- Output speed ( $\text{min}^{-1}$ ) =  $3000 / i$
- Choice of gearbox size:
- $M_{\text{rated S1}} \geq M_{\text{resistive at mot.}} \cdot i^*$
- $M_{\text{accel S5}} \geq M_{\text{resistive}} + M_{\text{accel driven weight}} \cdot i^*$
- Accel. torque at gearbox input limited to the value given in the selection data

## Rules for selecting servo gearboxes



Above 1000 starts/hour, the input acceleration torque of the gearbox must be reduced in accordance with the correction coefficient below.

Number of starts per hour	1000 to 2000	2000 to 3000	3000 to 5000	5000 to 10000
Correction coefficient	1 to 1.3	1.3 to 1.5	1.5 to 1.7	1.7 to 1.9

## *Servo gearbox selection data*

Example:

- ❑ UNIMOTOR SMV 95 UMB
- ❑ Useful acceleration torque = 10 N.m
- ❑ Output speed 200 min<sup>-1</sup>
- ❑ Angular backlash = 1'
- ❑ 800 starts/hour

## Servo gearbox selection example

### 95 UM B 30

Speed min-1 :	3000
Rated torque at rated speed (N.m) :	3,9
Peak torque (N.m) :	12,9
Moment of inertia without brake (10-4 kg.m <sup>2</sup> ) :	2,5
moment of inertia with braken (10-4 kg.m <sup>2</sup> ) :	2,79

Output speed	Gearbox size	Reduction		Gearbox input moment of inertia	S1 Rated output torque	S5 max output acceleration torque	Max input acceleration torque up to 1000 d/h
min-1		I		10-4 kg.m <sup>2</sup>	N.m	N.m	N.m
100,0	Mjd 0751	30,00	*	1,60	81	284	12,1
100,0	Mjd 0901	30,00	*	2,60	76	572	24,1
153,8	Mjd 0451	19,50	*	0,10	60	74	4,7
153,8	Mjd 0551	19,50	*	0,31	58	109	7,0
153,8	Mjd 0631	19,50	*	0,55	58	180	11,1
153,8	Mjd 0751	19,50	*	1,50	56	256	15,7
146,3	Mjd 0901	20,50	*	2,50	56	544	31,0
206,9	Mjd 0451	14,50	*	0,14	44	88	7,4
206,9	Mjd 0551	14,50	*	0,38	42	120	10,1
206,9	Mjd 0631	14,50	*	0,69	40	178	14,6
206,9	Mjd 0751	14,50	*	1,90	37	260	21,4

## Servo gearbox selection example

### 95 UM B 30

Speed min-1 :	3000
Rated torque at rated speed (N.m) :	3,9
Peak torque (N.m) :	12,9
Moment of inertia without brake (10-4 kg.m <sup>2</sup> ) :	2,5
moment of inertia with braken (10-4 kg.m <sup>2</sup> ) :	2,79

Output speed	Gearbox size	Reduction		Gearbox input moment of inertia	S1 Rated output torque	S5 max output acceleration torque	Max input acceleration torque up to 1000 d/h
min-1		I	*	10-4 kg.m <sup>2</sup>	N.m	N.m	N.m
100,0	Mjd 0751	30,00	*	1,60	81	284	12,1
100,0	Mjd 0901	30,00	*	2,60	76	572	24,1
153,8	Mjd 0451	19,50	*	0,10	60	74	4,7
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206,9	Mjd 0751	14,50	*	1,90	37	260	21,4

## *Servo gearbox selection data*

- ❑ Example :
- ❑ UNIMOTOR SMV 95 UMC
- ❑ Useful acceleration torque = 10 N.m
- ❑ Output speed 110 min<sup>-1</sup>
- ❑ Angular backlash 15'
- ❑ 4000 starts/hour

## Servo gearbox selection data

❑ Example:

❑ UNIMOTOR SMV 95 UMC

❑ Useful accel. torque =

10 N.m

$10 * 1.6 = 16 \text{ N.m}$

❑ Output speed  $110 \text{ min}^{-1}$

❑ Angular backlash  $15'$

❑ 4000 st/hr

Number of starts per hour	1000 to 2000	2000 to 3000	3000 to 5000	5000 to 10000
Correction coefficient	1 to 1.3	1.3 to 1.5	1.5 to 1.7	1.7 to 1.9

## Servo gearbox selection data

### 95 UM C 30

Speed min-1 :	3000
Rated torque at rated speed (N.m) :	5,4
Peak torque (N.m) :	17,7
Moment of inertia without brake (10-4 kg.m2) :	3,60
moment of inertia with braken (10-4 kg.m2) :	3,89

Output speed	Gearbox size	Reduction	Gearbox input moment of inertia	S1 Rated output torque	S5 max output acceleration torque	Max input acceleration torque up to 1000 d/h
min-1		I	10-4 kg m2	Nm	Nm	Nm
76,5	Cb 3233	39,2	0,41	208	458	11,9
76,1	Cb 3333	39,4	0,73	207	808	20,9
84,7	Cb 3133	35,4	0,12	188	204	5,9
84,5	Cb 3233	35,5	0,48	188	458	13,2
87,7	Cb 3333	34,2	0,93	179	808	24,1
98	Cb 3133	30,6	0,15	160	204	6,9
99	Cb 3233	30,3	0,62	159	458	15,4
99,3	Cb 3333	30,2	1,10	158	808	27,3
110,2	Cb 3133	27,2	0,18	143	204	7,7
111,5	Cb 3233	26,9	0,72	141	458	17,3
107,9	Cb 3333	27,8	1,28	148	808	29,6

## Servo gearbox selection data

### 95 UM C 30

Speed min-1 :	3000
Rated torque at rated speed (N.m) :	5,4
Peak torque (N.m) :	17,7
Moment of inertia without brake (10-4 kg.m <sup>2</sup> ) :	3,60
moment of inertia with braken (10-4 kg.m <sup>2</sup> ) :	3,89

Output speed	Gearbox size	Reduction	Gearbox input moment of inertia	S1 Rated output torque	S5 max output acceleration torque	Max input acceleration torque up to 1000 d/h
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107,9	Cb 3333	27,8	1,26	146	808	29,6

## *Applications and target markets*



- ❑ Special machines
- ❑ Packing: outer packing, cartoning, packaging, labelling, bagging, etc
- ❑ Printing: roller synchronisation, cutting, ejection, carousel, etc
- ❑ Robotic
- ❑ Gantry cranes
- ❑ Palettizers

## *Applications and target markets*



- ❑ Textile machines
- ❑ Wood working machines
- ❑ Machine tools
- ❑ Spooling, winding, unwinding machines
- ❑ Bottom beds (presses, etc)
- ❑ General high-speed materials handling



## *LS advantages*

Dynablocs are delivered ready-lubricated



- ❑ *Cb Dynabloc, Ot Dynabloc*<sup>1</sup>
  - ☛ mineral oil (synthetic as an option)
- ❑ *Mb Dynabloc*
  - ☛ permanently with synthetic oil
- ❑ *Mjd Dynabloc*<sup>1</sup>
  - ☛ permanently with synthetic oil
- ❑ *Pjl Dynabloc*
  - ☛ permanently with synthetic grease
- ❑ *Pjn Dynabloc*<sup>1</sup>
  - ☛ with synthetic oil

*1: Specify the operating position when ordering*

## *L S advantages*

Competitive range:

- Cost-effective standard backlash range
- Cost-effective basic backlash range, with planetary gear train *Pjl - Pjn Dynabloc*
- In the high performance low backlash area, the *Mjd Dynabloc* is a very attractive solution in relation to planetary train gearboxes.

## Scale of prices

ANGULAR BACKLASH	Shaft output	
	axial	perpendicular
<b>STANDARD: 12 to 30'</b>	<i>Cb Dynabloc = 26</i>	<i>Mb Dynabloc = 23</i>
<b>BASIC: 8 to 12'</b>	<i>Pjl Dynabloc = 100</i>	<i>Mjd Dynabloc = 55</i>
<b>MEDIUM: 3 to 5'</b>	<i>Pjn Dynabloc = 128</i>	<i>Mjd Dynabloc = 66</i>
<b>EXPERT: 1'</b>	<i>Pjn Dynabloc = 151</i>	<i>Mjd Dynabloc = 80</i>

Reference base **100**: Pjl 0901-0902 (80 N.m)

*Other possibilities: ➔ consult the factory*

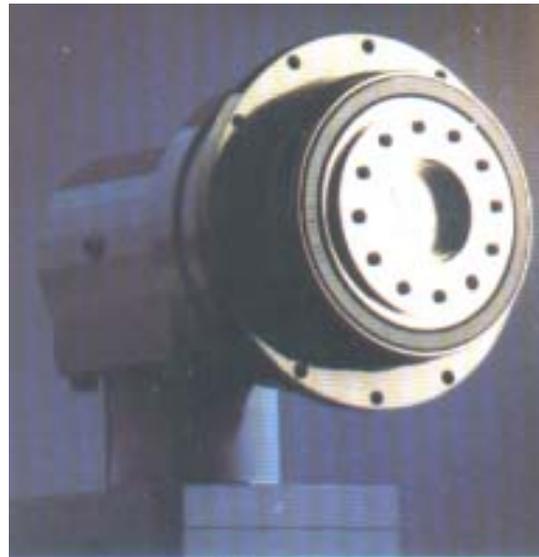
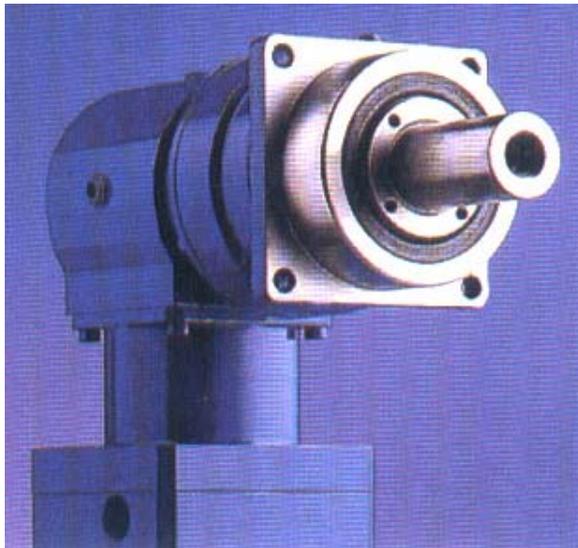
## Examples

- ❑ Other reduction ratios are available for the *Pjn Dynabloc* range:
  - ✓ Intermediate, between those given in the selection data
  - ✓ Greater than 1000 with a possibility of 4 gear trains.
- ❑ Possibility of supplying *Pjs Dynabloc* units

*Other possibilities: ➔ consult the factory*

## Examples

Possibility of offering products with different configurations



## *Marketing tools*

- Sales brochure/presentation  Available on INTRANET
- Documentation/selection data  Available on INTRANET
- Price lists  Available on INTRANET

## *Organisation, Service*

- ❑ **Factory support at Rabion**    ➔ Usual contacts
  - ✓ Requests for quotations, studies, specifications
  - ✓ Order processing
  - ✓ Organisation of customer visits
  
- ❑ **Technical specialist**                    ➔ Laurent RAMAT

## DELAI DES SERVOREDUCTEURS *Pjl, Pjn, Pjs, Mjd, Mb Dynabloc*

TYPE SERVOMOTEUR <u>SANS FREIN</u> arbre claveté	Quantité* par Cde		Quantité par Cde	
		DELAI		DELAI
75UMA300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
75UMB300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
75UMC300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
75UMD300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
95UMA300CACAA			toutes	7 semaines
95UMB300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
95UMC300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
95UMD300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
95UME300CACAA			toutes	7 semaines
115UMA300CACAA			toutes	7 semaines
115UMB300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
115UMC300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
115UMD300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
115UME300CACAA			toutes	7 semaines
142UMA300CACAA			toutes	7 semaines
142UMB300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
142UMC300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
142UMD300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
142UME300CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
190UMA200HACAA			toutes	7 semaines
190UMB200HACAA			toutes	7 semaines
190UMC200HACAA			toutes	7 semaines
190UMD200HACAA			toutes	7 semaines

\* Consulter pour autre quantité

## DELAI DES SERVOREDUCTEURS *Pjl, Pjn, Pjs, Mjd, Mb Dynabloc*

TYPE SERVOMOTEUR <b>AVEC FREIN</b> arbre claveté	Quantité* par Cde		DELAI	
75UMA301CACAA			toutes	7 semaines
75UMB301CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
75UMC301CACAA			toutes	7 semaines
75UMD301CACAA			toutes	7 semaines
95UMA301CACAA			toutes	7 semaines
95UMB301CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
95UMC301CACAA			toutes	7 semaines
95UMD301CACAA			toutes	7 semaines
95UME301CACAA			toutes	7 semaines
115UMA301CACAA			toutes	7 semaines
115UMB301CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
115UMC301CACAA			toutes	7 semaines
115UMD301CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
115UME301CACAA			toutes	7 semaines
142UMA301CACAA			toutes	7 semaines
142UMB301CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
142UMC301CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
142UMD301CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
142UME301CACAA	jusqu'à 2	3 semaines	toutes	7 semaines
190UMA201HACAA			toutes	7 semaines
190UMB201HACAA			toutes	7 semaines
190UMC201HACAA			toutes	7 semaines
190UMD201HACAA			toutes	7 semaines

\* Consulter pour autre quantité

## DELAI DES SERVOREDUCTEURS Cb, Ot Dynabloc et autres types avec SMV non standard

TYPE SERVOMOTEUR 1° Arbres spéciaux (lisses ou pour MI Cb-Ot...) 2° Désignations différentes de : - "CACAA" du 75 au 142 ou "HACAA" en 190	Quantité par Cde	DELAI
75UMA300 ou 301*	toutes	7 semaines
75UMB300 ou 301*	toutes	7 semaines
75UMC300 ou 301	toutes	7 semaines
75UMD300 ou 301	toutes	7 semaines
95UMA300 ou 301	toutes	7 semaines
95UMB300 ou 301*	toutes	7 semaines
95UMC300 ou 301*	toutes	7 semaines
95UMD300 ou 301	toutes	7 semaines
95UME300 ou 301	toutes	7 semaines
115UMA300 ou 301	toutes	7 semaines
115UMB300 ou 301	toutes	7 semaines
115UMC300 ou 301*	toutes	7 semaines
115UMD300 ou 301*	toutes	7 semaines
115UME300 ou 301	toutes	7 semaines
142UMA300 ou 301	toutes	7 semaines
142UMB300 ou 301	toutes	7 semaines
142UMC300 ou 301*	toutes	7 semaines
142UMD300 ou 301*	toutes	7 semaines
142UME300 ou 301*	toutes	7 semaines
190UMA200 ou 201 / 300 ou 301	toutes	7 semaines
190UMB200 ou 201 / 300 ou 301	toutes	7 semaines
190UMC200 ou 201 / 300 ou 301	toutes	7 semaines
190UMD200 ou 201 / 300 ou 301	toutes	7 semaines

\* Sélection des SMV pour Cb Dynabloc



The most comprehensive range  
on the market

