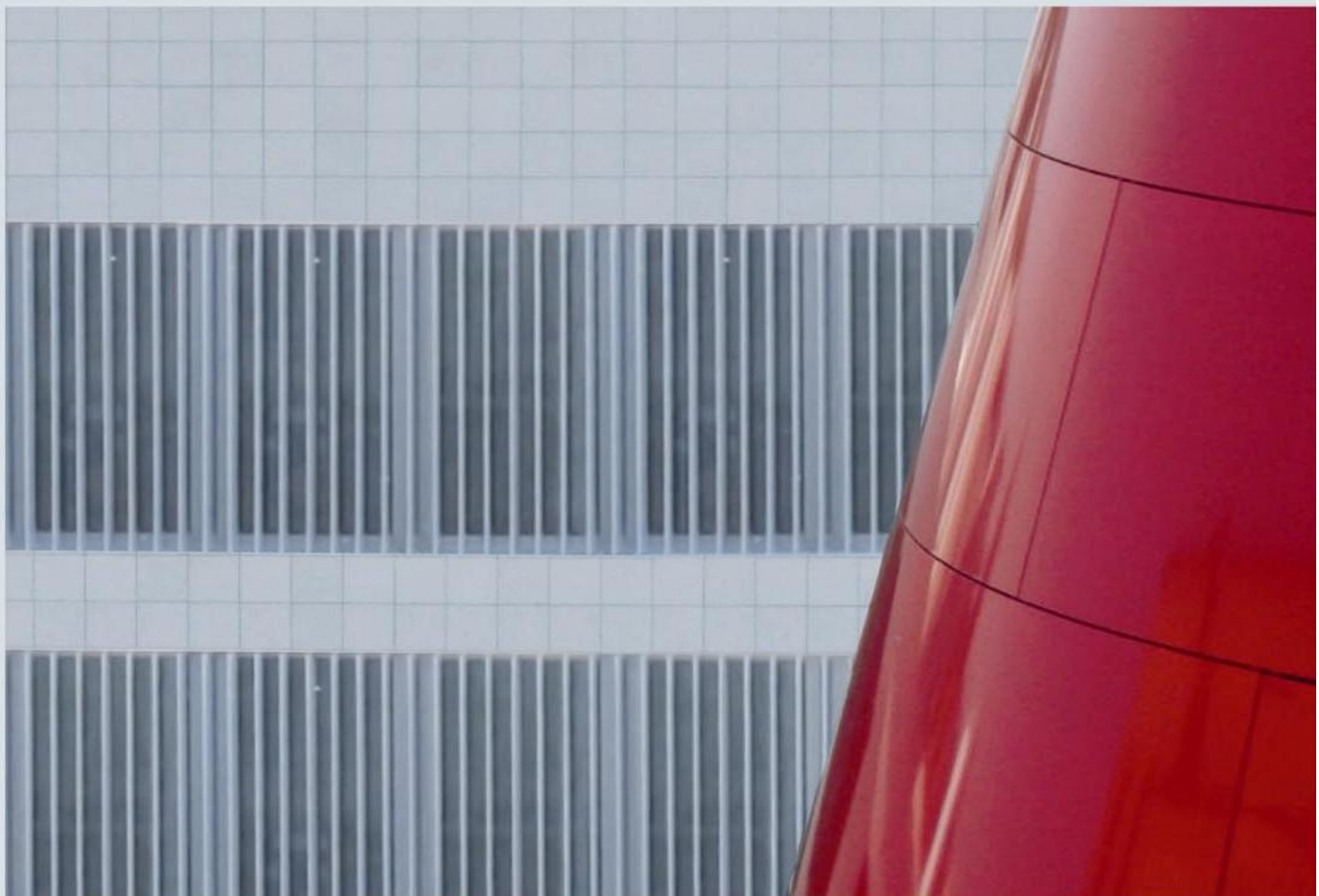


DRIVEACADEMY®



SEW
EURODRIVE



Product Training
Replacing a VARIBLOC or VARIMOT
Examples

NN

Exclusion of liability:

This training document supplements the documentation of SEW-EURODRIVE GmbH & Co KG. It has been prepared to the best of our knowledge as informative document accompanying training courses. SEW-EURODRIVE GmbH & Co KG accepts no liability for possible errors.

The basic requirement for safe operation is that you adhere to the operating instructions of the units described in the training document. The safety regulations mentioned in the operating instructions apply. SEW-EURODRIVE GmbH & Co KG assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.

Make sure that the operating instructions are available to persons responsible for the system and its operation as well as to persons who work independently on the unit. You must also ensure that the documentation is legible.

Goals of this training document:

To show the different possibilities to replace a VARIBLOC gear unit

Other documents:

- Gearmotor catalog
- Drive engineering – Project Planning of Drives

Content

1	Characteristics of Variable speed gear units	2
2	Example 1 - Replacing only with nameplate data	3
2.1	Given Data	3
2.1.1	Catalog data (here with DV Motor)	3
2.2	Select in the excel worksheet the VARIBLOC and the motor	4
2.3	Result	4
2.3.1	Customer needs the full speed range 1:6 and the torque characteristics of VARIMOT	4
2.3.2	Customer needs the maximum torque and a speed range $R = 1:5$	5
2.3.3	Customer needs a constant torque and a speed range $R=1:6$	5
2.3.4	Customer needs a constant torque and a speed range $R=1:5$	6
2.4	Selection with Data sheet 08 795 02 93	7
2.4.1	Full torque and full speed range $R = 1:6$	7
3	Example 1 - Real application	8
3.1	Customer data	8
3.2	Load data	9
3.3	Selected gearmotor:	9
3.3.1	Thermal load	9
3.4	Recalculation of example 2.3.1 and 2.3.2 with workbench and 400/195Nm	10
3.4.1	with $R 1:6$ (2.3.1)	10
3.4.2	with $R 1:5$ (2.3.2)	10
4	Example 2	11
4.1	We have to replace:	11
4.2	Solution 1 only with nameplate data	12
4.3	Solution 2 speed range $R 1:5$ with high torque	12
4.4	Solution 3 - speed range $R 1:5$ with low torque	13
4.5	Selection with Data sheet 08 795 02 93 – full torque and full speed range $R = 1:6$	14
4.6	Selection with Motor $f_{base} = 50\text{Hz}$ and Data sheet 08 795 02 93 - speed range $R = 1:5$ with low torque	15
4.7	Selection with Motor $f_{base} = 87\text{ Hz}$ in Delta and Data sheet 08 795 02 93 - speed range $R = 1:5$ with low torque	16
5	Summary	17
5.1	General	17
5.2	Comparison of selection with Excel sheet and with data sheet.	17
5.2.1	Example 1 - K47 VZ21 DT100LS4BMG	17
5.2.2	Example 2 - R97 VU DVE160M4	17
5.3	MOVIMOT or MOVITRAC?	18
5.3.1	Existing machine	18
5.3.2	New machine	18

Document information

File name: Replacing_a_VARIBLOC_or_VARIMOT_CU.docx rev 3 Title: Replacing a VARIBLOC or VARIMOT
 Created by: Michael Kropp Number of pages: 21 Saved on: 2-Nov-2009

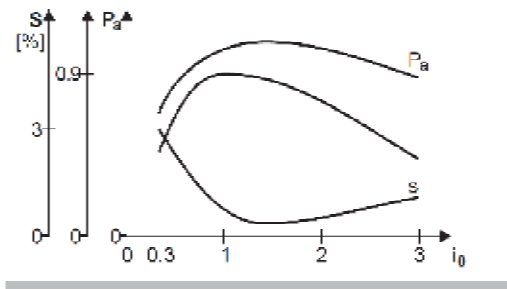
Print date: 2-Nov-2009

1 Characteristics of Variable speed gear units

Dimensioning criteria

Since mechanical variable speed gear units are not only speed variators but also torque variators, they must be dimensioned according to various criteria:

- According to constant torque
- According to constant power
- According to constant torque and constant power (each for a partial speed range)



00833BXX

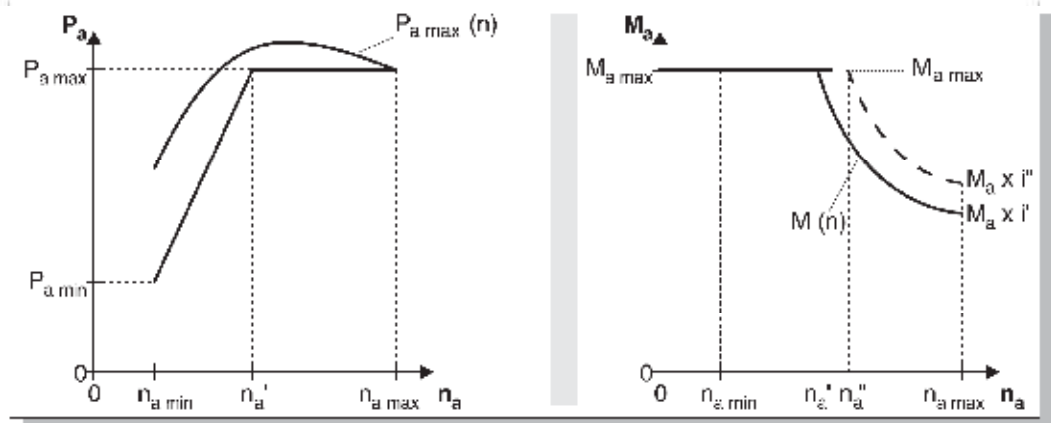
Figure 18: Variable speed gear unit parameters

- P_a = power
- η = efficiency
- s = slip
- i_0 = gear ratio of the variable speed gear unit

Dimensioning for constant power and constant torque

With this load type, the utilization of the variable speed gear unit is at its optimum. The reduction gear unit is to be dimensioned so that the maximum output torques can be transmitted. The power remains constant in the range $n_{a'} \dots n_{a \max}$; the torque remains constant in the range $n_{a \min} \dots n_{a'}$.

If the available speed range of the variable speed gear unit does not have to be fully utilized, it is expedient for reasons of efficiency to use a higher speed range. In the upper speed range, the slip of the variable speed gear unit is in fact at its lowest value and the transmittable power at its greatest.



00636BXX

Figure 21: Parameters of the variable speed gear units at constant torque and constant power

- $P_{a \max}(n)$ = maximum power according to test
- Definition torque M_a = limiting torque $M_{a \max}$ of the reduction gear unit
- $M(t)$ = permitted torque characteristics

Output power

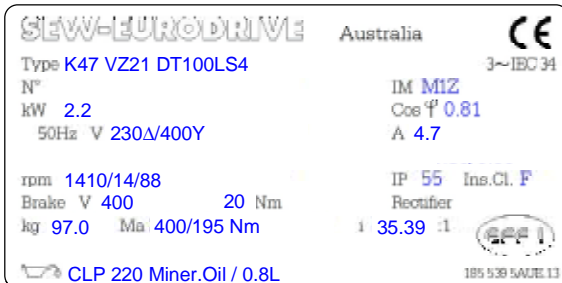
$$P_{a \min} - \frac{n_{a \min}}{n_{a'}} \cdot P_{a \max}$$

Example 1 - Replacing only with nameplate data

2 Example 1 - Replacing only with nameplate data

2.1 Given Data

Customer has given you the nameplate data of this gearmotor and wants to replace it with a VSD controlled drive.



You can use the Excel worksheet.

First you have to calculate the input speed of the gearbox and the speed range.

$$n_{e1} = 14 \text{ rpm} * 35.39 = 495 \text{ rpm}$$

$$n_{e2} = 88 \text{ rpm} * 35.39 = 3114 \text{ rpm}$$

$$\text{speed range: } 88/14 = 6.28 \Rightarrow R = 1:6$$

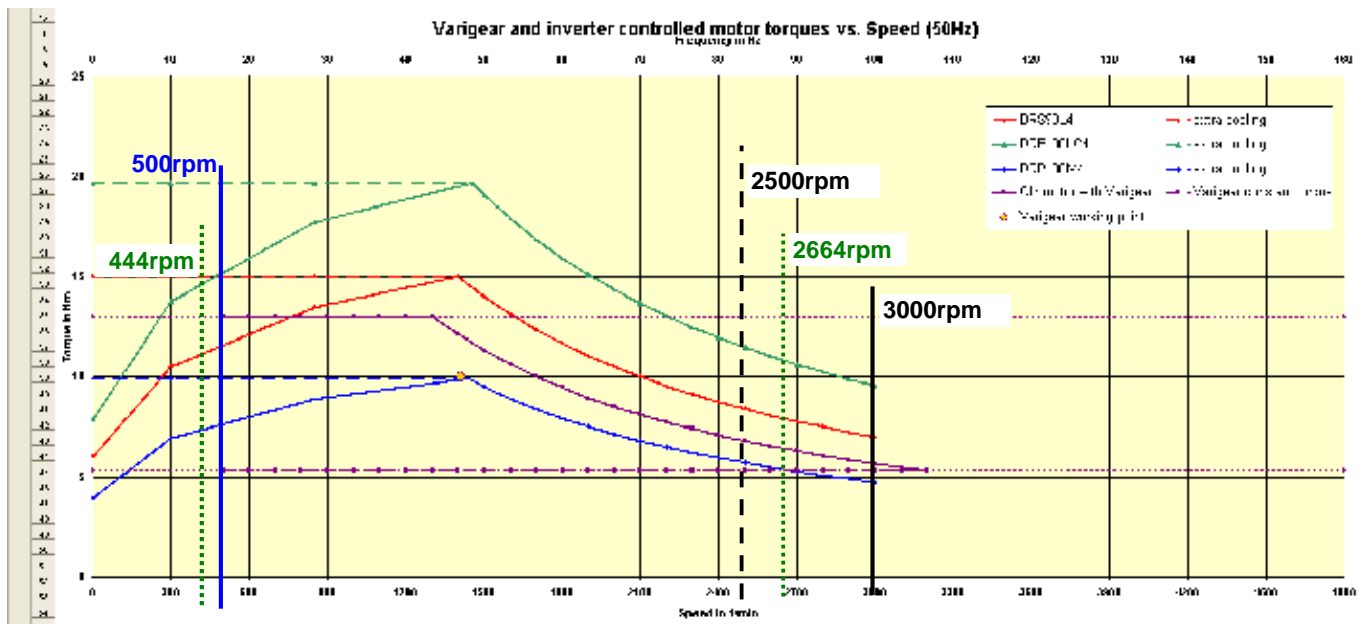
2.1.1 Catalog data (here with DV Motor)

R = 1:5 ... R = 1:6											m	
P_m/P_{a2} [kW]	n_{a1}	n_{a2}	i	M_{a1}	M_{a2}							
	[1/min]			[Nm]							[kg]	
2.2 / 1.8	8.1	49	63.30*	400	350	-						
	9.0	55	56.83	400	315	-						
	10	64	48.95*	400	270	-						
	11	68	46.03*	400	255	-						
	13	79	39.61	400	220	-						
	14	88	35.39	400	195	-						
	16	100	31.30	400	173	-						
	17	106	29.32	385	162	-						
	20	120	25.91	340	143	-						
	23	143	21.81	285	120	-	K 47	VU/VZ 21	DV 100M4	87	321	
	26	159	19.58	255	108	-	KF 47	VU/VZ 21	DV 100M4	90	322	
	30	185	16.86	220	93	-	KA 47	VU/VZ 21	DV 100M4	86	323	
	32	197	15.86	210	88	-	KAF 47	VU/VZ 21	DV 100M4	89	322	
	37	228	13.65	179	75	-						
	42	256	12.19	160	67	-						
	43	265	11.77	154	65	-						
	48	295	10.56	139	58	-						
	56	342	9.10	119	50	-						
60	364	8.56	112	47	-							
69	423	7.36	97	41	-							
77	474	6.58	86	36	-							
88	536	5.81	76	32	-							
3.0 / 2.5	2.2	13	153.21*	3560	1770	-	K 97	VU/VZ 31	DV 132S6	265	336	



The information in catalog are always in S1 duty.
If we replace a variable speed drive remember it.

2.2 Select in the excel worksheet the VARIBLOC and the motor



2.3 Result

2.3.1 Customer needs the full speed range 1:6 and the torque characteristics of VARIMOT

In this case we chose the DRE 100LC4, because of the thermal load (S1) at low speed
 \Rightarrow green curve (DRE 100LC4).

selected motor: DRE100LC4 (3kW),

Inverter: i.e. MOVITRAC B 0022-503-4-00, 50 Hz characteristics because the power of the motor with the red curve (DRS90L4, 2.2kW) is enough

gear unit: The maximum speed of motor should be 3000rpm or less.

new gear ratio: $3000/88 = 34 \Rightarrow$ selected: **K57 with $i = 30.28$**
 because the physical combination K47 $i = 31.30$ is not possible
 $n_{\text{emax}} = 88 * 30.28 = 2664 \text{ rpm}$, $n_{\text{emin}} = 2664 \text{ rpm} / 6 = 444 \text{ rpm}$

Brake: We select the brake with 1.5x of output torque.
 $400 \text{ Nm} / 30.28 * 1.5 = 19.8 \text{ Nm} \Rightarrow$ **20 Nm**

Solution: Gearmotor: **K57DRE100LC4 BE5, $i = 30.28$, s.f. 1.0**

Inverter: **MOVITRAC B 0022-503-4-00 or MOVITRAC LTE 0022-503-4-00**

MOVIMOT: **K57DRE100LC4 BE5 / MM30**