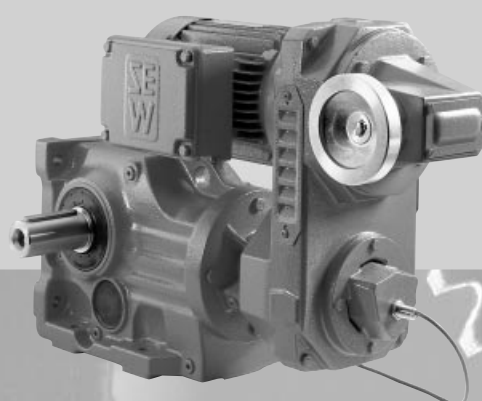


Explosion-Proof VARIBLOC® Variable Speed Gear Units and Options

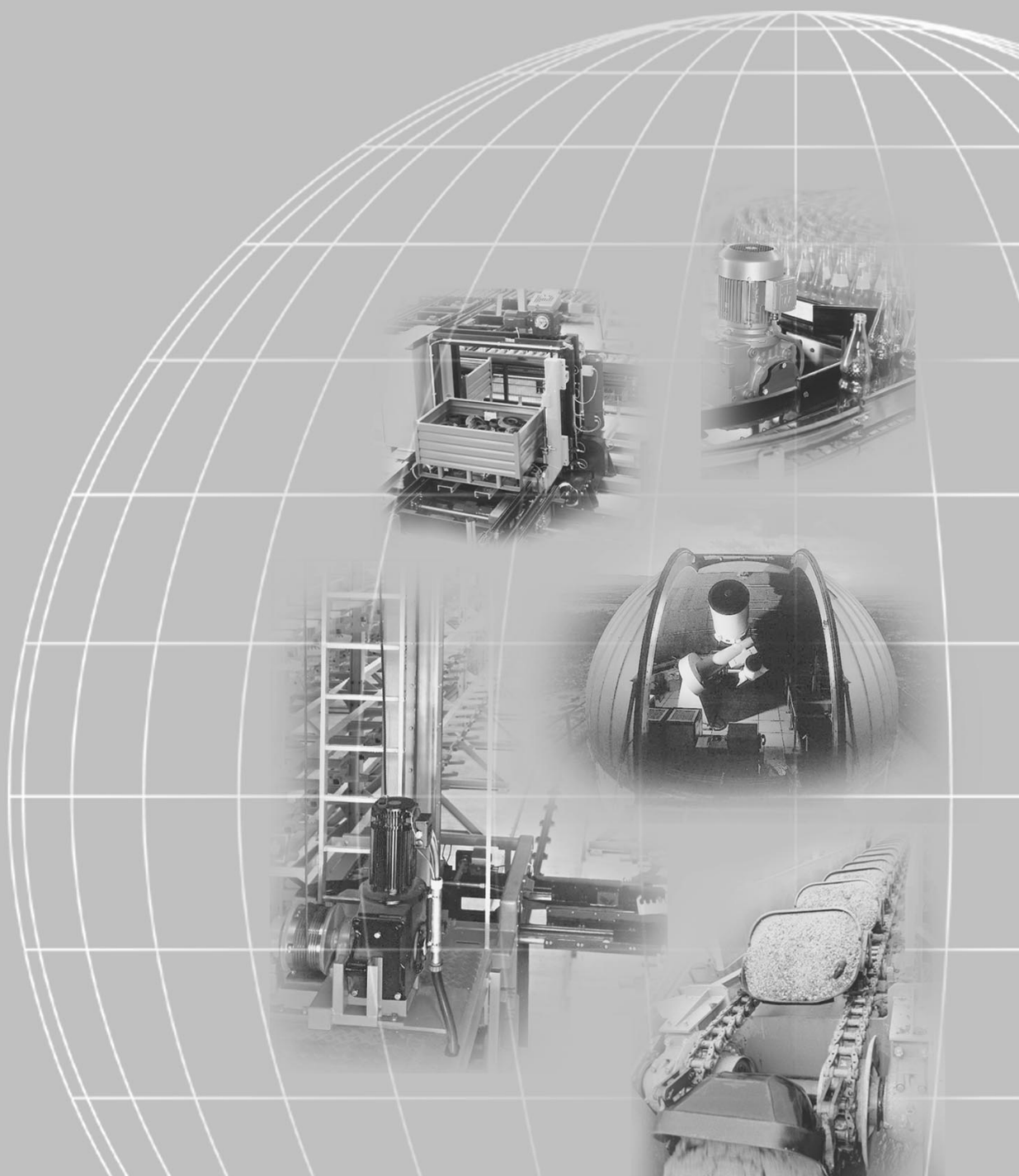
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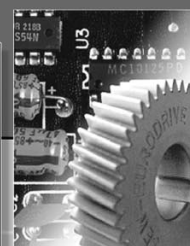
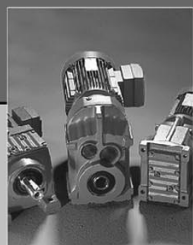


Operating Instructions

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1 Important Notes

Safety and warning instructions

Always follow the warnings and safety instructions in this publication!



Electrical hazard

Possible effects: Serious or fatal injury.



Immediate danger

Possible effects: Serious or fatal injury.



Dangerous situation

Possible effects: Minor injury.



Harmful situation

Possible effects: Damage to equipment or surroundings.



Application hints and useful information.



Important Notes on Explosion Protection



Close adherence to these instructions is required for fault-free operation and fulfillment of any warranty claims. Read these instructions carefully before you start operating the unit!

These operating instructions contain vital servicing information and should be kept close to the drive unit.

Disposal



This product consists of:

- Iron
- Aluminium
- Plastic
- Rubber

All components should be disposed of in accordance with applicable regulations.



2 Safety Notes

2.1 Safety notes for the use of VARIBLOC®

The following safety notes apply to variable speed gear units.

When using **variable speed geared motors**, please observe safety notes for gear units and motors in the appropriate operating instructions.

Please refer to the additional safety instructions in the individual sections of these operating instructions.

Explosive gas mixtures or dust concentrations in combination with hot, energized and moving parts of electrical machinery can cause serious injury or death.

Installation, connection, startup, and maintenance and repair work on the VARIBLOC® variable speed gear units and the optional electrical components may only be performed by qualified personnel while taking the following into account:

- these instructions
- warning and instruction labels on the variable speed gear unit / variable speed geared motor
- all other project planning documentation, startup instructions and wiring diagrams
- system-specific regulations and requirements
- currently effective national/regional regulations (explosion protection/safety/accident prevention)



Intended use

The variable speed gear units / variable speed geared motors are intended for industrial systems and may only be used in accordance with the information provided in SEW's technical documentation and the information listed on the nameplate. They correspond to standards and regulations and fulfill the requirements of directive 94/9/EG (ATEX 100a) (see sections 4.1 and 4.2).

A drive motor connected to the VARIBLOC® may not be operated on the frequency inverter.

Optional equipment



It complies with existing standards and regulations.

- EN50014
- EN50018 for protection type "d"
- EN50019 for protection type "e"
- EN50020 intrinsically safe "i"
- EN50281-1-1/EN50281-1-2 "Electrical equipment for use in atmospheres with combustible dust"

In addition to general installation guidelines, the following regulations in accordance with EleXV 1 (or other national regulations) should be observed for electrically operated options:

- EN 60 079-14 "Electrical systems used in potentially explosive atmospheres"
- EN 50281-1-1 "Electrical equipment for use in atmospheres with combustible dust"
- DIN VDE 105-9 "Operating electrical equipment" or other national regulations
- DIN VDE 0100 "Erection of power installations with rated voltages below 1000 V" or other national regulations
- System-specific regulations

Technical data and information on approved conditions on site can be found on the nameplate and in these operating instructions.

These details must be strictly observed!





3 VARIBLOC® as Explosion-Protected Design

3.1 Unit design

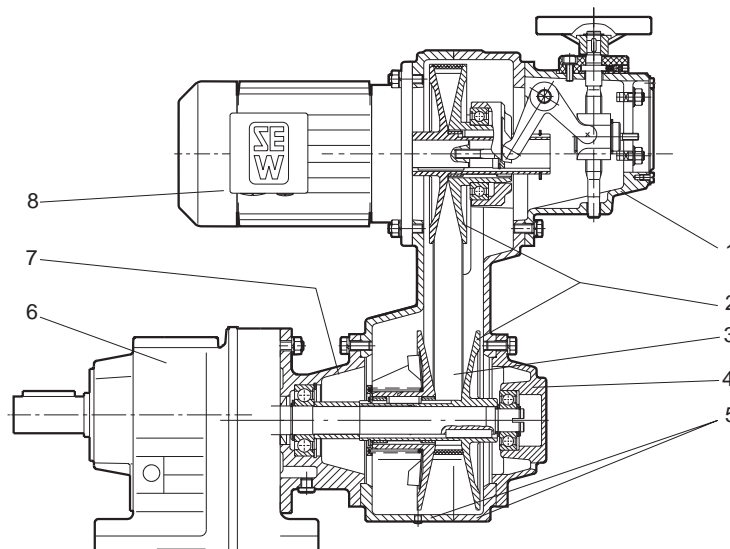


Figure 1: VARIBLOC® in explosion-protected design

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- 1 Angular adjustment device
- 2 Adjustment discs
- 3 Wide V-belt
- 4 Bearing cover with M12X1 tapped hole
- 5 Two-part variable speed gear unit housing
- 6 Secondary reduction gear unit
- 7 Output flange
- 8 Drive motor

3.2 Type designation

Example

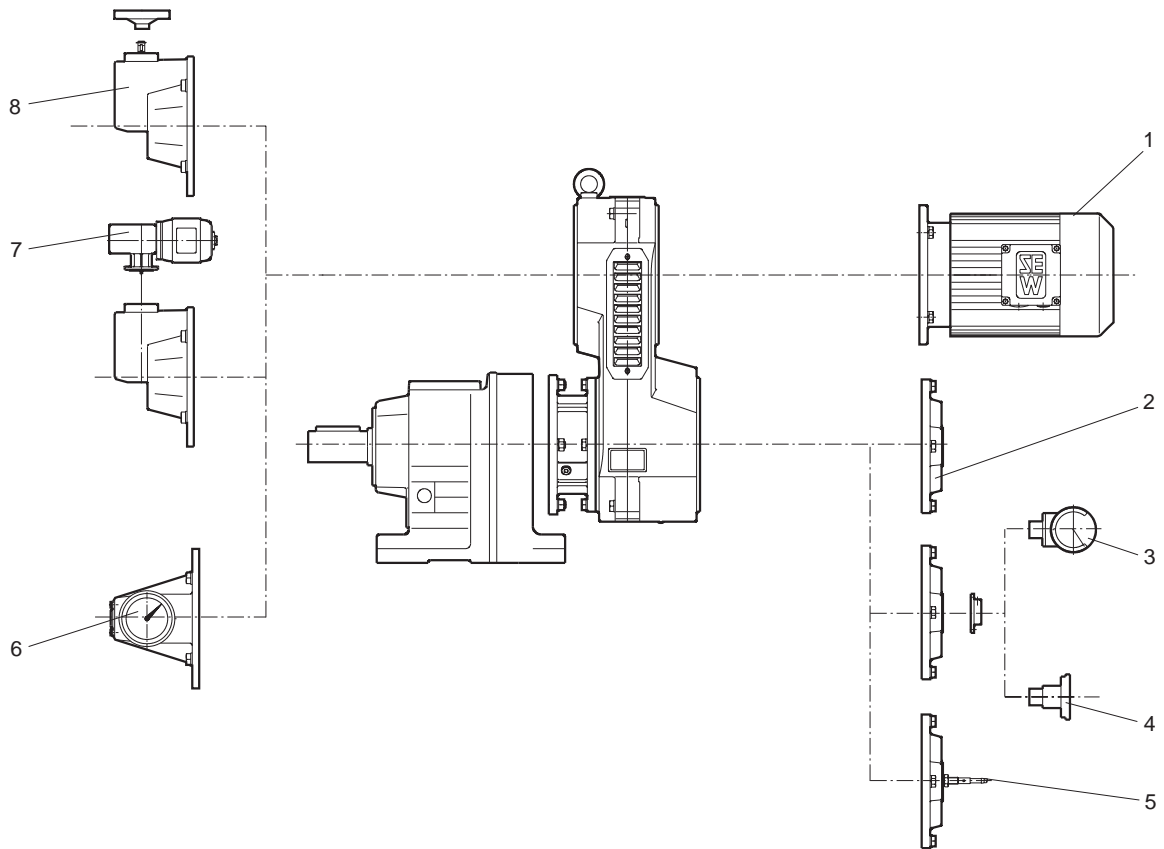
VU 21B H WEX II2G eDT 90L 4 TF

- VARIBLOC® variable speed gear unit series
- U shaped force flow
- Size VARIBLOC® variable speed gear unit
- B indicates wet design
- Angle adjustment device
- Speed monitor
- Ex version to ATEX 100a
- Motor type
- Motor size
- Number of poles on motor
- Temperature sensor

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3.3 Overview of mounting options



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Figure 2: Overview of mounting options

- 1 Drive motor
- 2 Bearing cover with M12x1 tapped hole (standard equipment)
- 3 Right-angle tachometer TW
- 4 Axial tachometer TA
- 5 Voltage encoder IGEX
- 6 Adjustment device with handwheel and position indication HS
- 7 Electromechanical remote speed adjustment EFEX
- 8 Adjustment device with handwheel H (standard equipment) / with free shaft end NV



4 Setup



Pay close attention to safety notes on page 5 during setup of variable speed gear unit!

4.1 VARIBLOC® in category 2G and 2D

General notes

- SEW's explosion-proof variable speed gear units of **VARIBLOC®** series **01-41** meet the design requirements of unit group II, **categories 2G** (gas explosion atmosphere) **and 2D** (explosive dust atmosphere). These units are intended for use in **zones 1 and 21**.
- SEW's explosion-proof variable speed gear units of **VARIBLOC®** series **51** meet the design requirements of unit group II, **categories 2G** (gas explosion atmosphere). These units are intended for use in **zone 1**.
- Standard feature of SEW's explosion-proof variable speed gear units of the **VARIBLOC®** series is a M12x1 tapped hole for installation of a voltage encoder.

Enclosure

- Only **VARIBLOC®** variable speed gear units in enclosed design may be used in category 2D. This design meets enclosure IP5X according to EN60529.

Designation "X"

- If the designation "X" follows the conformity certificate number or the EC design test certificate, it refers to special conditions in this certificate for the safe use of variable speed gear units.

Temperature class

- **VARIBLOC®** variable speed gear units of category 2G (gas explosion atmosphere) are certified for temperature class T3. The temperature class of the variable speed gear unit can be found on the nameplate.

Surface temperature

- The surface temperature of **VARIBLOC®** variable speed gear units in category 2D (dust explosion atmosphere) is not to exceed 200 °C. The system operator has to make sure that there is no dust accumulation of more than 5 mm according to EN50281-1-2.

Ambient temperature

- **VARIBLOC®** variable speed gear units in category 2G and 2D may only be used at an ambient temperature of –20 °C to +40 °C.

Output power and output torque

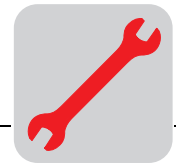
- Maintain nominal values of output power or output torque.

Speed monitoring

- **VARIBLOC®** variable speed gear units of category 2G and 2D may only be started up with functional speed monitoring. The speed monitor must be correctly installed and adjusted (see Section "Speed monitoring" on page 14).



Verify speed monitoring function prior to startup!



4.2 VARIBLOC® in category 3G and 3D

General notes

- SEW's explosion-proof variable speed gear units of the **VARIBLOC® series 01-51** meet the design requirements of unit group II, **category 3G** (gas explosion atmosphere) **and 3D** (dust explosion atmosphere). They are intended for use in **zones 2 and 22**.

Temperature class

- Standard feature of SEW's explosion-proof variable speed gear units of the VARIBLOC® series is a M12x1 tapped hole for installation of a voltage encoder.

Surface temperature

- VARIBLOC® variable speed gear units of category 3G (gas explosion atmosphere) are certified for temperature class T4. The temperature class of the variable speed gear unit can be found on the nameplate.

Ambient temperature

- The maximum surface temperature for VARIBLOC® variable speed gear units of category 3D (dust explosion atmosphere) may not exceed 135 °C. The system operator has to make sure that there is no dust accumulation of more than 5 mm according to EN50281-1-2.

Output power and output torque

- VARIBLOC® variable speed gear units in category 3G and 3D may only be used at an ambient temperature of –20 °C to +40 °C.

- Maintain nominal values for output power or output torque. The unit operator must ensure that there is no overload or blocking of the variable gear unit output shaft.



If an overload condition of the VARIBLOC® as a unit of category 3G or 3D cannot be ruled out during standard operation, a VARIBLOC® unit with a functioning speed monitor must be used (see Section "Speed monitoring" on page 14).

4.3 Before you begin

The drive may only be installed if



- the information on the nameplate of the drive corresponds to the approved on-site explosion application range (unit group, category, zone, temperature class or maximum surface temperature)
- the data on the nameplate of the drive match the supply voltage
- the drive is not damaged (no damage resulting from shipping or storage)
- the following requirements have been properly met:
 - ambient temperature between -20 °C and +40 °C,
 - when there are no potentially explosive atmospheres, oils, acids, gases, vapors, radiation, etc. during installation
- the enclosure type IP5X according to EN60529 for VARIBLOC® of category 2D has been verified

4.4 Preliminary work after extended storage

Variable speed gear units

Output shafts and flange surfaces must be completely free of anti-corrosion agents, contamination or other impurities (use a commercially available solvent). Do not let the solvent get in contact with the sealing lips of the oil seals or the wide V-belt – danger of damage to the material!

Please note:

- The service life of the lubricant in the bearings is reduced if the unit is stored for more than one (1) year
- The enclosed wide V-belt must be installed.



Anti-friction bearing grease

	Ambient temperature	Base	Original filling	Brand
Gear unit anti-friction bearing	-20 °C to +40 °C	synthetic	Mobiltemp SHC 100	Mobil

4.5 Setup

The variable speed gear units or geared motor may be mounted or installed only in the specified position on a level¹⁾, vibration-free and torsionally rigid support structure. Do not tighten housing legs and mounting flanges against each other.



Please note:

- VARIBLOC[®] design HS (handwheel with position indication) must be mounted so that the adjusting spindle is horizontal; otherwise the position indication will not function properly.
- **The breather valves must be easily accessible! The plastic plug of the condensation drain hole in variable speed gear units of category 2G, 3G and 3D at the lowest position must be removed prior to operation (danger of corrosion!)**
- **The plastic plug of the condensation drain hole at the lowest position for category 2D variable speed gear units may not be removed.**
- Carefully align the variable speed drives to avoid overloading the motor shaft (observe permissible overhung loads and axial forces!).
- Do not hammer or hit the shaft end.
- **Protect vertical mounting positions with a cover to prevent contaminants and liquids from entering (protective cowl C)! Cover the vent plate on top of a control box in level position (determined by the mounting position) with a cover plate included in the delivery.**
- Ensure adequate supply of cooling air and that heated air from other units is not drawn in. The cooling air may not exceed a temperature of 40 °C.
- VARIBLOC[®] gear units are supplied in corrosion-resistant versions (Design B) for use in damp areas or in the open. Any damage to the paintwork (e.g. on the breather valve) must be repaired.
- In the delivery state, all **cable entries** are fitted with ATEX-certified plugs.
- In order to establish the **correct cable entry**, the plugs are replaced by **ATEX certified cable screw fittings with strain relief**.
- Select the cable screw fitting according to the outer diameter of the cable being used.
- All **non-required cable entries must be sealed** with an ATEX certified plug after the installation is completed.

Installation in damp areas or in the open

Cable entry, screw-type conduit fitting

1) Maximum permitted flatness error for flange mounting (approximate value with reference to DIN ISO 1101): with → flange 120 – 600 mm max. error 0.2 – 0.5 mm



- Coat the threads of cable screw fittings and sealing plugs with sealant. Tighten well and apply another coat of sealant. Properly seal the cable entries.
- Thoroughly clean the sealing surfaces of the terminal box and terminal box cover before re-assembly. Replace porous seals!

Painting the gear unit

If the drive will be overpainted or partially repainted, ensure that the breather valve and oil seals are carefully covered with tape. Remove tape strips after the paint work is finished.

Required tools

- Wrench set
- Mounting device
- Shims and distance rings, if necessary
- Mounting materials for output components

Installation tolerances

Shaft end	Flanges
Diametric tolerances in accordance with DIN 748 <ul style="list-style-type: none"> • ISO k6 for solid shafts with $d, d_1 \leq 50$ mm • ISO k7 for solid shafts with $d, d_1 > 50$ mm • Center hole according to DIN 332, shape DR. 	Centering shoulder tolerances in accordance with DIN 42948 <ul style="list-style-type: none"> • ISO j6 with $b_1 \leq 230$ mm • ISO h6 with $b_1 > 230$ mm

4.6 Mounting of output components

Figure 3 shows an example of a mounting device for mounting clutches or hubs onto shaft ends of variable speed gear units or motors. It may be possible to remove the thrust bearing on the mounting device..

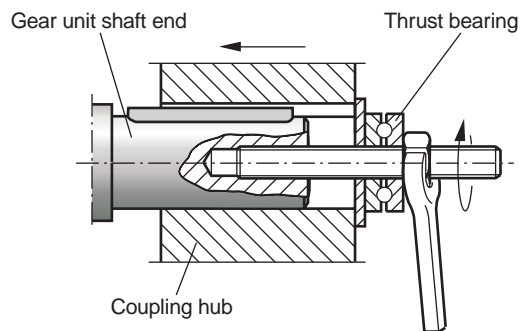
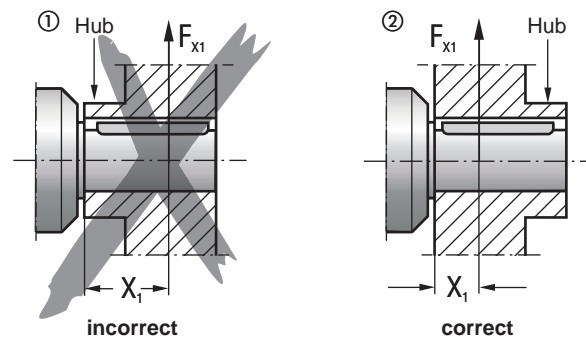


Figure 3: Example of a fitting tool

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Figure 4 shows the correct mounting arrangement ② of a gear or sprocket wheel in order to avoid impermissible overhung loads.



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Figure 4: Correct mounting arrangement of a gear or sprocket wheel

- Only use a mounting device (see Figure 3) for installing input and output elements. Use the center bore and the thread on the shaft end for positioning purposes.
- **Never mount belt pulleys, clutches, pinions, etc. onto the shaft end by hitting them with a hammer (damage to bearings, housing and the shaft!).**
- **Please observe correct tension of belt for belt pulleys (in accordance with manufacturer's specifications).**
- Power transmission elements should be balanced after fitting and must not give rise to excessive radial or axial forces (see Figure 4 / approved values see the "Geared Motors" catalog).



Note:

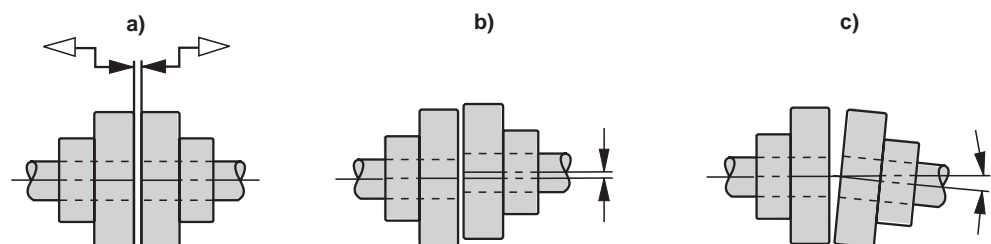
- Assembly is easier if you first apply lubricant to the output element or heat it up briefly (80–100 °C).



Assembly of couplings

The following items must be balanced according to the coupling manufacturers specifications when mounting couplings:

- Maximum and minimum clearance
- Axial offset
- Angular offset



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Figure 5



Input and output elements such as belt pulleys, clutches, etc. must be equipped with a touchguard element!



5 Startup

5.1 Connecting the EFEX adjustment device

EFEX electromechanical remote speed control

Note:

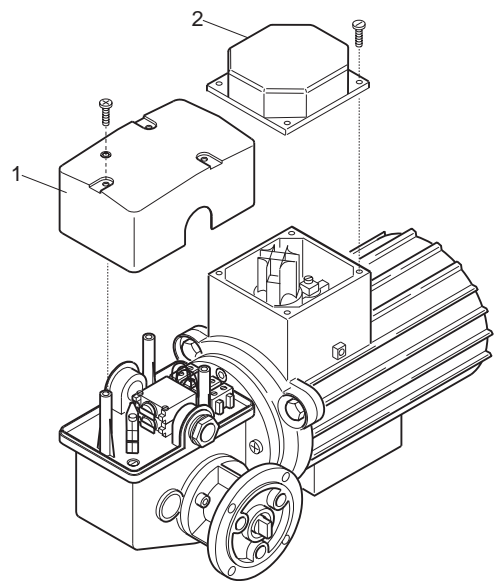
The EFEX electromechanical remote speed control EFEX is designed for 100 % cdf and a switching rate of ≤ 20 times per hour. It is not suitable for automatic control.



No explosive atmosphere may be present during installation work!

Connecting the EFEX servomotor

1. Remove housing cover (1) from switch element of the servomotor and the terminal box cover (2).
2. Electrically connect the device
 - according to the enclosed wiring diagram
 - according to information on the nameplate
3. Re-fasten housing cover (1) and terminal box cover (2).



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Figure 6: EFEX servomotor

Limiting the speed range for EFEX

The operating cams for the limit switches are factory set so the complete speed range of the VARIMOT[®] variable speed geared motor is available.



A subsequent change of the speed range is not permissible!



5.2 Installation and setup of optional equipment

Speed monitoring



It is not allowed to operate the variable speed gear unit of categories 2D or 2G without speed monitoring!

Standard design

The standard design of the VARIBLOC® explosion-proof variable speed gear unit features an M12x1 tapped hole that will accept a voltage encoder in the bearing cover of the variable speed gear unit. Speed monitor and voltage encoder must be supplied and installed by the operator of the device.

Additional designs

The following additional designs of speed monitoring are possible:

1. WEXA:
 - Speed monitor (incl. evaluation electronics) with IGEX voltage encoder and contactless digital remote speed indicator.
2. WEX:
 - Speed monitor (incl. evaluation electronics) with IGEX voltage encoder.
3. IGEX:
 - This design consists only of the IGEX voltage encoder. The speed monitor must be supplied and installed by the operator of the device.

Manufacturer's data

Speed monitor with WEXA/WEX design:

Manufacturer: Pepperl + Fuchs, Mannheim

Type: KFD2-DW-Ex1.D

Auxiliary power supply: 24 V_{DC}

PTB no.: Ex-89.C2145

Voltage encoder in WEXA/WEX/IGEX design:

Manufacturer: Pepperl + Fuchs, Mannheim

Type: NCB12-12GM35-N0 in accordance with DIN 19234 (NAMUR),

Housing: M12x1

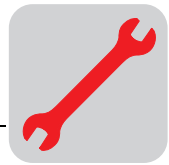
PTB no.: Ex95D2086X



All installation and adjustment notes given below refer to the speed monitor or voltage encoder for the WEXA/WEX design.



If other speed monitors are used, they must be installed and started up according to the manufacturer's documentation. The section "Installation and adjustment of deviating speed monitors" on page 18 contains information on determining the switching speed or switching frequency for this particular case.



Installation and adjustment of the WEXA/WEX speed monitor



1. Read the operating instructions of the speed monitor manufacturer before you begin with the installation!

The speed monitor must be located outside the potentially explosive atmosphere.

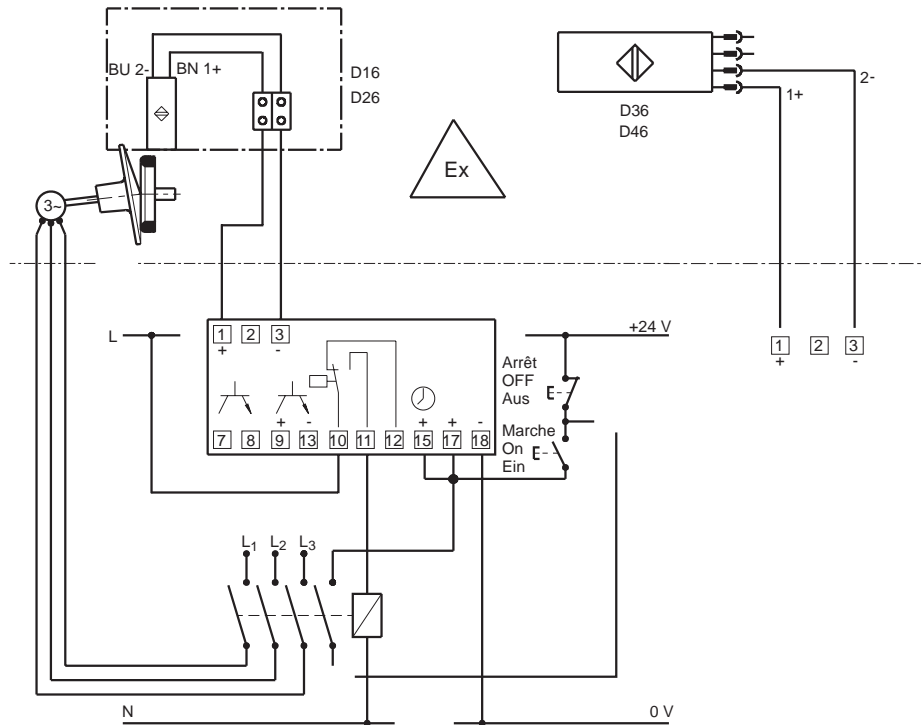


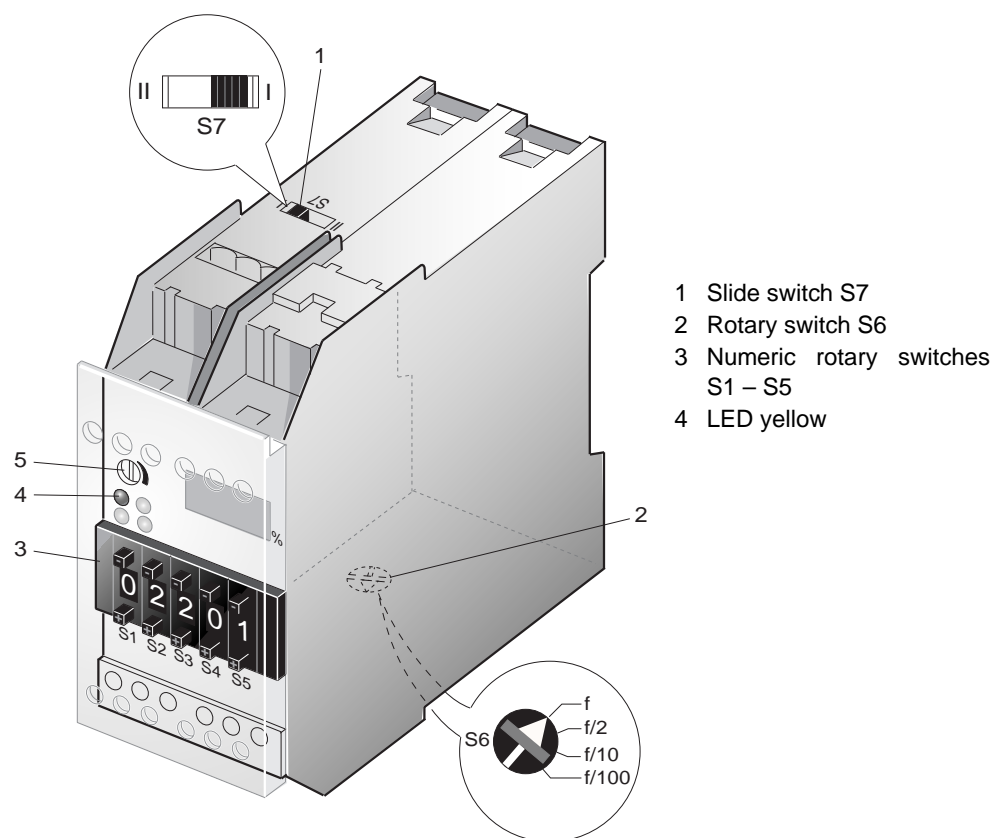
Figure 7: Connecting WEXA/WEX speed monitor

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Terminal assignment

1 Sensor +	11 Signal
3 Sensor -	12 Signal
7 Fault message +	13 Speed stepping -
8 Fault message -	15 Start bypass
9 Speed stepping +	17 Auxiliary power supply +
10 Signal	18 Auxiliary power supply -

2. Perform the basic adjustment of the speed monitor in accordance with the operating instructions of the speed monitor manufacturer and Table 1.



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Figure 8: Speed monitor in WEXA/WEX design

Unit / unit part	Position	Setting	Meaning
Numeric rotary switch S1	Front side of unit	According to Table 2	Switching frequency
Numeric rotary switch S2		According to Table 2	Switching frequency
Numeric rotary switch S3		According to Table 2	Switching frequency
Numeric rotary switch S4		0	Exponent
Numeric rotary switch S5		1	Time constant
Rotary switch S6	Bottom side of unit	f	Pulse divider
Slide switch S7	Top side of unit	I	Sensor type
Spindle-operated potentiometer	Front side of unit	5 seconds	Start bypass

Table 1: Basic setting of speed monitor

The start bypass time may not exceed 3 seconds. This setting must always be carefully executed and verified with a final measuring step!





Setting the switching frequency with the numeric rotary switches

Variable speed gear unit type	Motor pole number	Motor frequency [Hz]	Numeric rotary switch		
			S1	S2	S3
VUF / VZF01 VUF / VZF01B	4	50	0	1	8
	6			1	2
	8			0	9
	4	60	0	2	2
	6			1	4
	8			1	1
VUF / VZF11 VUF / VZF11B	4	50	0	1	5
	6			1	0
	8			0	8
	4	60	0	1	9
	6			1	3
	8			0	9
VUF / VFZ21 VUF / VFZ21B	4	50	0	1	5
	6			1	0
	8			0	7
	4	60	0	1	8
	6			1	2
	8			0	9
VUF / VZF31 VUF / VZF31B	4	50	0	1	5
	6			1	0
	8			0	7
	4	60	0	1	8
	6			1	2
	8			0	9
VUF / VZF41 VUF / VZF41B	4	50	0	1	5
	6			1	0
	8			0	7
	4	60	0	1	8
	6			1	2
	8			0	9
VUF51 / 51B	4	50	0	1	5
	6			1	0
	8			0	7
	4	60	0	1	8
	6			1	2
	8			0	9

Table 2: Switching frequencies of speed monitor in WEXA/WEX design

**Installation and adjustment of deviating speed monitors**

If other speed monitors are used, they must feature an intrinsically safe sensor input (identification color: blue) for evaluation of sensors according to DIN 19234 (NAMUR) and be approved for use of this sensor in explosive atmospheres.

The voltage encoder (sensor) generally features a blue connection lead and must conform to DIN 19234 (NAMUR). The corresponding inspection number may be attached to the voltage encoder or the connection lead.



If the switching speed of the variable speed gear unit is less than that in table 3 (Page 19), the drive motor must be immediately disconnected from its supply voltage.

Before re-startup of the variable speed gear unit, the fault must be corrected and the variable speed gear unit must be stopped for at least 15 minutes. If a wrong operation by the operating personnel cannot be ruled out, this interval should be brought about by an automatically operating restarting lock.

If vibrations or increased operating noises are noticeable after restarting the variable speed gear unit, the wide V-belt was damaged during the blocking and must be replaced (see "Replacing wide V-belt (Figure 13)" on page 26).



The start bypass time may not exceed 5 seconds. This setting must be carefully executed and verified by a final measuring step!



Variable speed gear unit type	Motor pole number	Motor frequency [Hz]	Switching speed [rpm]	Pulses per revolution	Switching frequency [Hz]
VUF / VZF01 VUF / VZF01B	4	50	534.6	2	18
	6		356.4		12
	8		267.3		9
	4	60	653.4		22
	6		415.8		14
	8		267.3		11
VUF / VZF11 VUF / VZF11B	4	50	445.5		15
	6		297.0		10
	8		237.6		8
	4	60	564.3		19
	6		386.1		13
	8		267.3		9
VUF / VZF21 VUF / VZF21B	4	50	445.5		15
	6		297.0		10
	8		207.9		7
	4	60	534.6		18
	6		356.4		12
	8		267.3		9
VUF / VZF31 VUF / VZF31B	4	50	445.5		15
	6		297.0		10
	8		207.9		7
	4	60	534.6		18
	6		356.4		12
	8		267.3		9
VUF / VZF41 VUF / VZF41B	4	50	445.5	2	15
	6		297.0		10
	8		207.9		7
	4	60	534.6		18
	6		356.4		12
	8		267.3		9
VUF51 / 51B	4	50	445.5		15
	6		297.0		10
	8		207.9		7
	4	60	534.6		18
	6		356.4		12
	8		267.3		9

Table 3: Determining the switching speed / switching frequency for deviating speed monitors



Installation of the voltage encoder

1. Rotate the output shaft of the variable speed gear unit until the slotted screw head can be seen through the tapped hole in the bearing cover.
2. Voltage encoder:
 - carefully screw it into the bearing cover (1) of the variable speed gear unit until the voltage encoder (5) rests on the screw head (2)
 - turn it back one turn and secure it with lock nut (3)

This sets the switching interval x to one (1) mm. During operation, the voltage encoder supplies two pulses per revolution at this switching interval.

Changing switching interval x

If no circuit state change occurs at the voltage encoder (LED display) with rotating shaft of the variable speed gear unit operating with switching interval $x = 1$ mm, the switching interval can be changed as follows (Fig. 9):

1. With **constantly lit LED (4)** of the voltage encoder, turn the voltage encoder a half turn counterclockwise at a time and check its function.
2. If the **LED (4) is not lit**, turn the voltage encoder clockwise by 90 degrees but **no more than two times**.



Do not turn the voltage encoder more than half a turn into the tapped hole since it would be destroyed by a collision with the slotted screw heads.

3. If a circuit state change still does not occur, check the voltage supply of the voltage encoder using the evaluation electronics (with WEXA/WEX design).

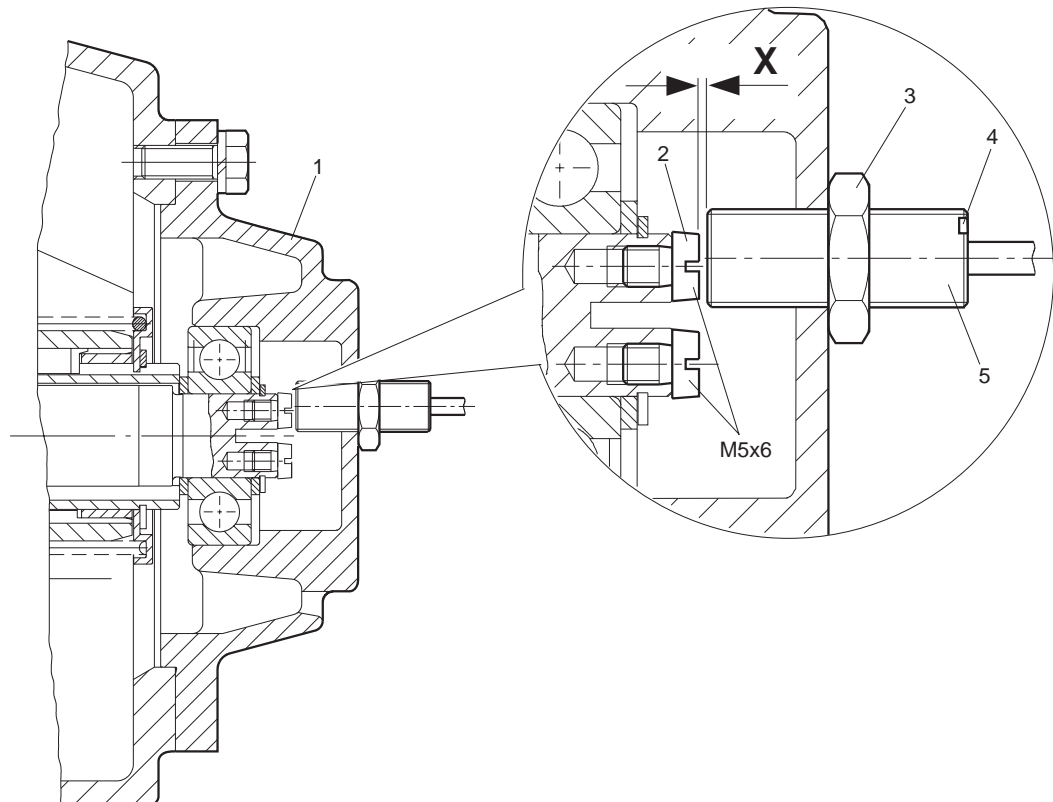
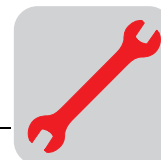


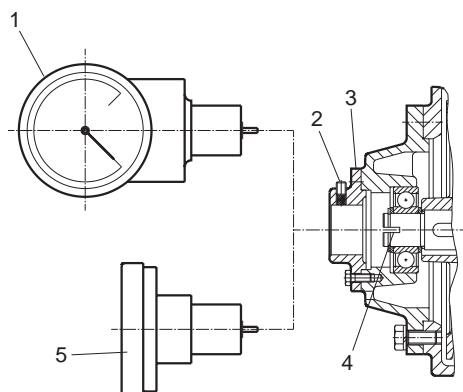
Fig. 9: Installation of voltage encoder and setting of switching interval x

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Installation of angular speedometer TW, axial speedometer TA

1. Install angular speedometer TW (1) or axial speedometer TA (5) in speedometer flange (3):
 - Tongue must engage in shaft groove (4)
2. Secure TW or TA speedometer with setscrew (2)



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Fig. 10: Installation of angular speedometer TW, axial speedometer TA



The TW and TA speedometers may only be installed in variable speed gear units of category 3D/3G, if the mounting of a voltage encoder (version WEXA/WEX, IGEX) is not necessary.

Contactless digital remote speed indicator

The contactless digital remote speed indicator, which is included in the WEXA design, is connected to the pulse output of the speed monitor type KFD2-DW-Ex1.D made by Pepperl + Fuchs.

Technical data

Manufacturer:	Dr. Horn
Type:	HDA 4110-50
Display unit:	digital
Mains connection:	115 or 230 V, 50-60 Hz
Power consumption:	approx. 4.2 VA
Encoder connection:	with two-core cable, shielded

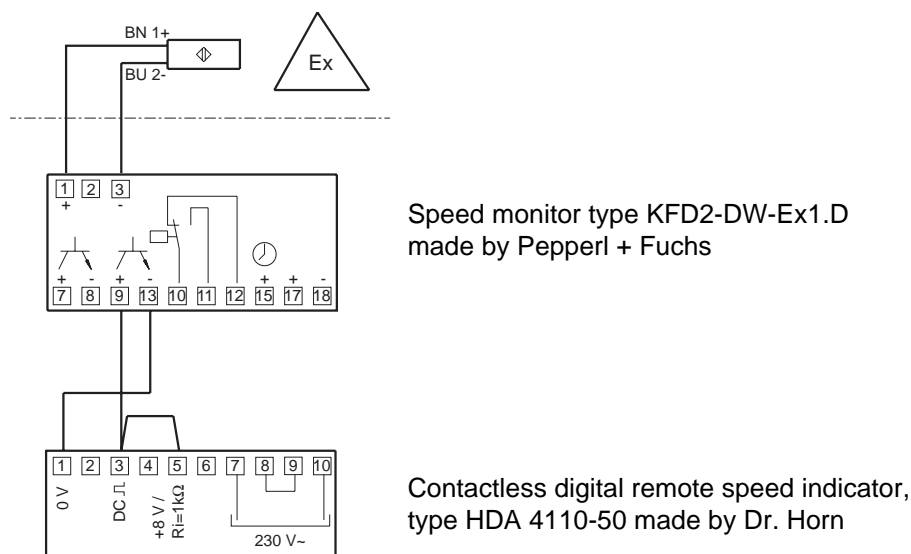


Observe the respective wiring regulations for the explosion hazards area during the electrical installation of optional equipment.



Connection/ adjustment

1. Connect the unit according to the wiring diagram (Figure 11).



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Figure 11: Wiring diagram of digital remote speed indicator to speed monitor



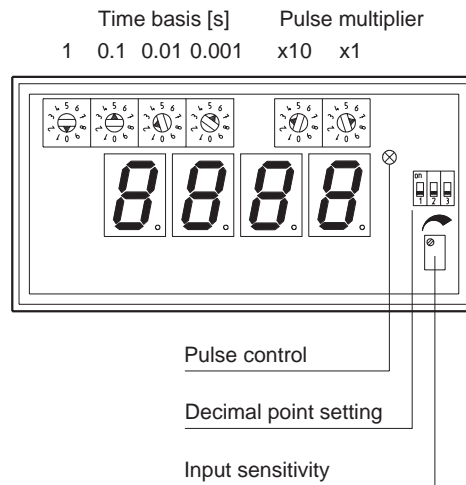
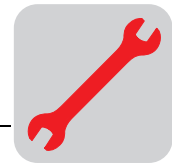
This wiring diagram applies only to digital indicator units type HDA 4110-50 made by Dr. Horn in combination with speed monitors type KFD2-DW-Ex1.D made by Pepperl + Fuchs.

2. Note the jumpers:
 - between terminals 3 and 5
 - between terminals 8 and 9 for 230 V_{AC} auxiliary power supply



With an auxiliary power supply of 115 V_{AC}, the wiring of terminals 7, 8, 9, and 10 must be changed according to the manufacturer's documentation!

3. Adjust measuring interval (Figure 12 and "Calculation examples digital remote speed indicator" on page 24)
 - Calculation using a formula
 - Data according to Table 4
4. Adjust input sensitivity (Figure 12):
 - Turn potentiometer "input sensitivity" clockwise until pulse indicator light starts to light up



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Figure 12: Adjusting the digital remote speed indicator

Setting data

- Accuracy of indication: + / -1 of last digit
- Measuring interval (quartz): adjustment in increments of 0.001 s in the range of 0.010 s to 9.999 s after removing the face plate, recommended measuring interval: 0.5 to 2 s
- Pulse multiplier: adjustment in the range from 1 to 99 after removing the face plate
- Decimal point setting: via DIP switch after removing the face plate
- Calculation of measuring interval: $\text{Measuringinterval} = \frac{60 \cdot A}{n \cdot k \cdot z \cdot f}$

A = 4-digit display (at maximum speed), without decimal indication

n = speed (Table 4)

k = pulse multiplier ≥ 1

z = pulses / revolution (Table 4)

f = calculation factor (at 50 Hz = 1, at 60 Hz = 1.2)

Type / Size VARIBLOC®	Pulses / revolution	VARIBLOC® reference speed [rpm]		
		R = 1:6 / 6:1		
		4-pole	6-pole	8-pole
VUF / VZF 01	2	3312	2088	1632
VUF / VZF 11		3250	2160	1615
VUF / VZF 21		3100	2050	1530
VUF / VZF 31		3100	2050	1540
VUF / VZF 41		3053	2035	1505
VUF / VZF 51		3106	2056	1526

Table 4: Reference data of digital remote speed indicator



Calculation examples digital remote speed indicator

	Example 1	Example 2
Drive	R107R77VU21WEXA/II2G eDT90L4	R107R77VU21WEXA/II2G eDT90L4
Data	Output speed $n_a = 1.0 - 6.3$ Pulses / revolution $z = 2$ (Table 4) max. speed of variable speed gear unit = 3100 rpm (Table 4)	Output speed $n_a = 1.0 - 6.3$ Pulses / revolution $z = 2$ (Table 4) max. speed of variable speed gear unit = 3100 rpm (Table 4)
Desired indication	Output speed $A = 1,000 - 6,300$ rpm	Belt speed $A = 0.114 \cdot 0.72$ m/min
$\frac{60 \cdot A}{n \cdot k \cdot z \cdot f}$	$\frac{60 \cdot 6300}{3100 \cdot 1 \cdot 2 \cdot 1} = 60,96s$	$\frac{60 \cdot 0720}{3100 \cdot 1 \cdot 2 \cdot 1} = 6,968s$
Recomm. measuring interval	0.5 - 2 s (max. 9,999 s)	
Calculation with new pulse multiplier	$k = 50$ Measuring interval = $\frac{60 \cdot 6300}{3100 \cdot 50 \cdot 2 \cdot 1} = 1,219s$	$k = 8$ Measuring interval = $\frac{60 \cdot 0720}{3100 \cdot 8 \cdot 2 \cdot 1} = 0,871s$
Device setup	Measuring interval: [1] [2] [1] [9] Pulse multiplier: [5] [0] Decimal point setting: 1	Measuring interval: [0] [8] [7] [1] Pulse multiplier: [0] [8] Decimal point setting: 1



6 Inspection / Maintenance



Close adherence to the inspection and maintenance intervals is absolutely necessary to ensure safe working conditions and explosion protection!

6.1 Inspection and maintenance intervals

Unit/Component	Interval	What to do?	Details on page ...
VARIBLOC®	As required	Eliminate dust accumulation > 5 mm through cleaning	
VARIBLOC®	Weekly	Pass through speed range	
VARIBLOC®	Every 3000 operating hours, at least every six months	<ul style="list-style-type: none"> Inspect wide V-belt Clean ventilation openings Check bearings; lubricate, clean as needed Check oil seals and replace with original SEW spare parts in case of heavy wear (porous, brittle) VARIBLOC® category 2D: Check seals of cover plates and replace with original SEW spare parts in case of heavy wear (porous, brittle) Check operating noise / temperature of anti-friction bearing <p>Interior of variable speed gear unit:</p> <ul style="list-style-type: none"> Check for dust accumulation Remove existing dust deposits 	<p>see "Checking wide V-belt" on page 26</p> <p>see "Measure temperature of anti-friction bearing" on page 28</p>
VARIBLOC®	Every 6000 hours of operation	Replace wide V-belt	see "Replacing wide V-belt (Figure 13)" on page 26
VARIBLOC®	Every 20000 hours of operation	Replace bearings	
EFEX	Every 20 000 variations At least every six months	<p>Check adjustment spindle</p> <ul style="list-style-type: none"> replace, if necessary otherwise lubricate 	

6.2 Before you begin

Required tools

- Wrench set
- Hammer
- Mandrel or drift punch
- Snap ring mounting press



6.3 Inspection / maintenance of VARIBLOC®



- Service and maintenance of SEW variable speed gear units in category 2G, 2D, 3G and 3D may be performed by SEW or qualified personnel only.
- Use only OEM spare parts on the appropriate and valid spare parts list; otherwise, the explosion rating of the variable speed drive will become void.
- Disconnect the variable speed drive from the power supply and protect against unintentional re-start!

Checking wide V-belt

If one or more of the following test questions are answered positively ("Yes"), the wide V-belt must be replaced (see "Replacing wide V-belt (Figure 13)" on page 26).

Type of check	For VUF 01-51 / VZF 01-41 check
Functional test	<ul style="list-style-type: none"> • Do you notice a loud noise? • Did the maximum attainable speed drop by more than 10 % compared to the nameplate data? • Are there any speed fluctuations?
Visual inspection	Remove ventilation plates: <ul style="list-style-type: none"> • Is there a lot of abraded dust noticeable at the ventilation plates or in the entire housing? • Are the sides of the belt frayed? • Is the wide V-belt cracking between the ribs or already torn?

Replacing wide V-belt (Figure 13)



1. Adjust and arrest variable speed geared motor to highest speed.
2. **De-energize the variable speed geared motor and secure it against unintentional re-start ! Block output side.**
3. Remove both lateral ventilation plates (1).
4. Remove bearing cover (2) and adjustment unit (3).
5. Loosen housing screws; separate control box halves A and B.
6. Secure driven spring-opposed adjustment disc GV with wooden shim (8).



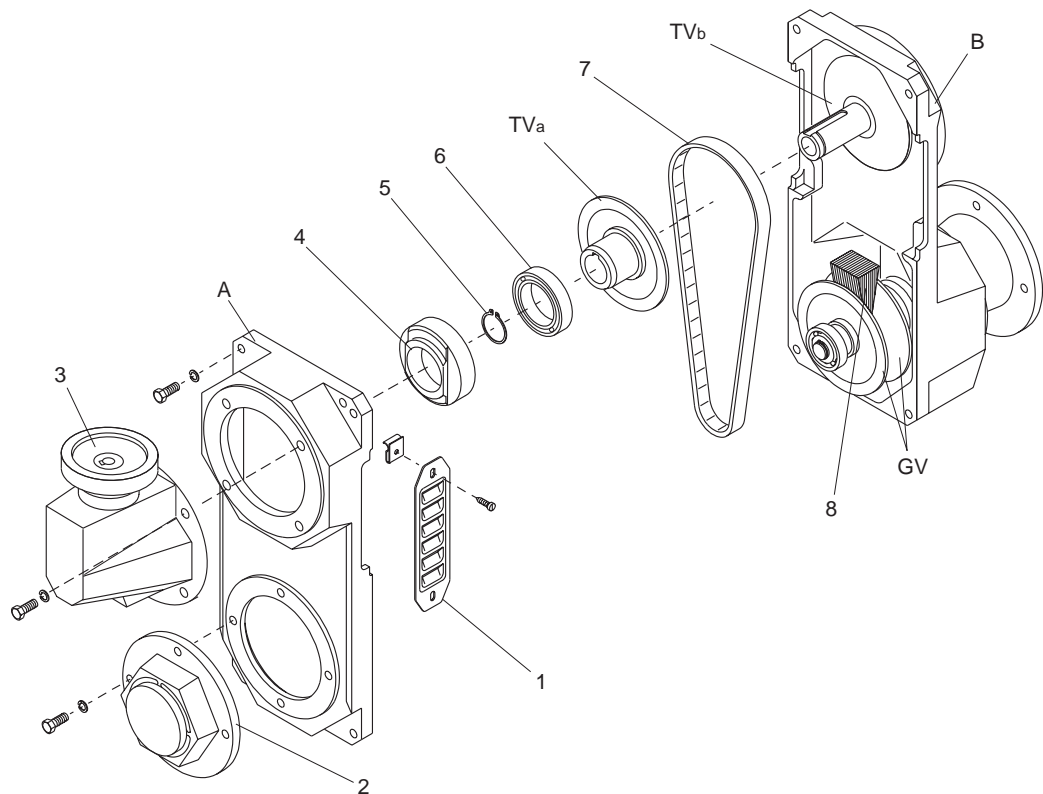
Caution:

Disc halves should not be allowed to snap together through spring load.

7. Remove:
 - Adjustment sleeve (4) (for front adjustment), snap ring (5), driving adjustment disc halves TV_a.
8. Remove old wide V-Belt (7) and insert new wide V-Belt.
9. Install:
 - driving adjustment disc half TV_a, ball bearing (6), snap ring (5), adjustment sleeve (4)
10. Remove wooden shim.
11. Bolt control box halves A and B together.



12. Install adjustment unit and bearing cover.
13. Attach ventilation plates.
14. Tighten wide V-belt.
 - turn positioning spindle clockwise using adjustment unit (3) until resistance is noticeable.
15. Check torsional play at output shaft.
 - correct: minor torsional play is noticeable
16. Remove blocking from output side (see point 2).
17. Switch on geared motor.
18. Slowly pass through the speed range.
 - correct: drive runs smoothly and evenly.



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Figure 13: Replacing wide V-belt for VUF 01-51 and VZF 01-41

Legend

- | | |
|---------------------------|----------------------------|
| 1 Ventilation plate | 6 Ball bearing |
| 2 Bearing cover | 7 Wide V-belt |
| 3 Angular adjustment unit | 8 Wooden shim |
| 4 Adjustment ring | TV Driving adjustment disc |
| 5 Snap ring | GV Driven adjustment disc |



*Every 3000 operating hours, at least every six months:
Measure temperature of anti-friction bearing*



To ensure safe working conditions and explosion protection, it is necessary that the difference between the temperature of the anti-friction bearing and ambient temperature does not exceed the following values at the indicated test points:

Test point	Temperature difference
T1 (A, B, C)	40 K
T2A	50 K
T2B	40 K
T3	50 K



If one of these values is exceeded, the corresponding anti-friction bearing must be replaced.

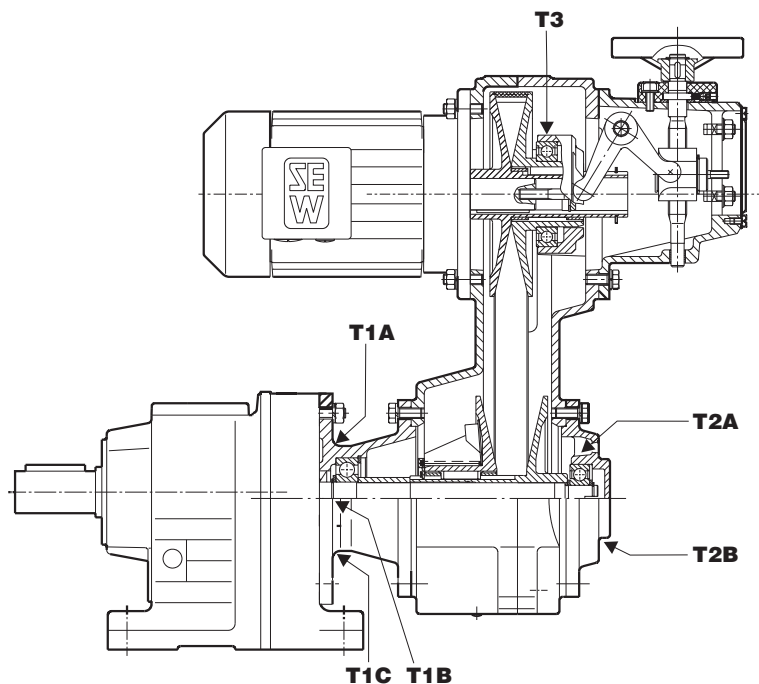


Figure 14: Measuring temperature of anti-friction bearing

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The temperature of the anti-friction bearing can be measured with commercially available thermometers. Select a thermometer of sufficient length.



1. The bearing temperature of **bearing 1** can be measured **during operation** at one of the test points T1A, T1B or T1C depending on the mounting position and accessibility.
2. The bearing temperature of **bearing 2** and **bearing 3** may **only** be measured **during standstill** at test points T2A and T3.

**Measuring the anti-friction bearing temperature of bearing 2 (T2A, T2B):**

If a design-specific protective cover is attached to bearing 2, it must first be removed.

1. For **ventilated** variable speed gear units, the test point T2A is located approx. 15 to 20 mm behind the ventilation slot.
2. For **non-ventilated** variable speed gear units, the test point T2A is not accessible. In this case, the temperature of the anti-friction bearing can be measured at test point T2B during operation.

Measuring the anti-friction bearing temperature of bearing 3 (T3):

1. Change the setting range until test point T3 is accessible.
2. Shut down the variable speed gear unit and secure against unintentional re-start.
3. Remove the ventilation plate (see Figure 13, pos. 1).
4. Measure the temperature of the anti-friction bearing at test point T3.
5. Re-adjust the setting range.

Limiting the speed range for designs NV, H, HS

The limit speeds n_{\min} and n_{\max} are factory set and may not be changed.

If the maximum speed should drop by more than 10 % due to wear of the wide V-belt, the wide V-belt must be replaced with an original SEW spare part.



6.4 Inspection / maintenance of optional equipment

Relubricate EFEX adjustment spindle

1. Remove control head (1) from control box (2).
– Loosen screws (3).
2. Lubricate adjustment spindle (4) with well-adhering lubricant, e. g. "Never Seize normal."
3. Assemble in reverse order.

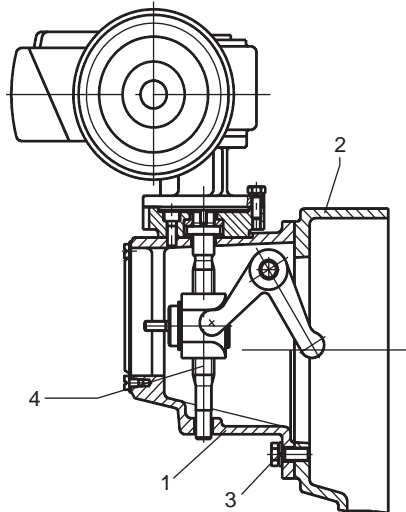


Figure 15: Relubricating the EFEX adjustment spindle

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6.5 Finalizing the inspection / maintenance process



- Ensure that the variable speed drive is assembled correctly and all openings have been plugged after service and maintenance work of variable speed drives of category 2D. The explosion protection is highly dependent upon the IP enclosure.
- Please ensure that ventilation openings of the bearing cover for variable speed drives of categories 2G, 3G, and 3D that are located on top are protected by a cowl in the area of the bearing cover to prevent foreign bodies from entering.
- If the mounting position requires for the control box to be mounted horizontally, then the ventilation plate located on the top must be covered by the cover plate that is included in the delivery.
- For variable speed drives of category 2D, all ventilation openings must be closed dust-tight.
- Perform safety and function checks.



7 Operation and Service

Please provide the following information if you require assistance from customer service:

- Nameplate information
- State type and extent of the fault
- Time and circumstances of the fault
- Presumed cause

7.1 Malfunction of VARIBLOC® variable speed gear units

Fault	Possible cause	Solution
Drive slips or speed monitoring is triggered	Wide V-belt is worn	Replace wide V-belt (Section "Replacing wide V-belt (Figure 13)" on page 26)
	Wide V-belt or face of adjustment disc is contaminated	<ul style="list-style-type: none"> • Replace wide V-belt with original SEW spare part (Section "Replacing wide V-belt (Figure 13)" on page 26) • Clean adjustment disc with solvent or similar product
	Load is too high	Check picked off power and reduce to catalog values
Drive warms up excessively	Load is too high	see above
Drive is too loud	Wide V-belt is damaged Note: Damage can occur e. g. <ul style="list-style-type: none"> • after brief stalling of the drive • with impulse loading of the drive 	1. Correct cause 2. Replace wide V-belt with original SEW spare part (Section "Replacing wide V-belt (Figure 13)" on page 26)

7.2 Malfunction of optional equipment

EFEX electromechanical remote speed control

Fault	Possible cause	Solution
Speed cannot be adjusted	Unit is not properly connected	Connect unit correctly according to wiring diagram



**Speed monitoring
in WEXA/WEX
design**

Fault	Possible cause	Solution
No function of the voltage encoder	Voltage encoder is not properly connected	Check voltage supply of voltage encoder using the evaluation electronics With correct voltage supply: <ul style="list-style-type: none"> • Consult manufacturer's documentation! • Voltage encoder is not suitable for connection to the evaluation electronics (IGEX design) • Replace voltage encoder
LED at voltage encoder is not lit or is lit constantly	Switching interval is too large or too small	Set switching interval (Section "Changing switching interval x" on page 20)
No display	<ul style="list-style-type: none"> • Display unit is not properly connected • Voltage supply is missing or interrupted 	<ul style="list-style-type: none"> • Connect display unit correctly according to wiring diagram • Check voltage supply according to wiring diagram
Incorrect display	Display unit is not properly adjusted	Check settings according to Section "Setting data" on page 23



7.3 Statement of Conformity

Variable speed gear units category 2G and 2D, VARIBLOC® Series 01-41 and category 2G, VARIBLOC® Series 51



**SEW
EURODRIVE**

Konformitätserklärung

Declaration of Conformity

(im Sinne der Richtlinie 94/9/EG, Anhang VIII)

(according to EC Directive 94/9/EC, Appendix VIII)

SEW-EURODRIVE GmbH & Co
Ernst Blickle Str. 42
D-76646 Bruchsal

SEW-EURODRIVE

erklärt in alleiniger Verantwortung, dass die Verstellgetriebe der Kategorie 2G und 2D der Baureihe VARIBLOC® 01-41, und der Kategorie 2G der Baureihe VARIBLOC® 51 auf die sich diese Erklärung bezieht, mit der

declares in sole responsibility that the variable speed gear drives in categories 2G and 2D of the VARIBLOC® 01-41 series, and in category 2G of the VARIBLOC® 51 series that are subject to this declaration are meeting the requirements set forth in

Richtlinie 94/9/EG

Directive 94/9/EG

übereinstimmen.

Angewandte Norm: **EN1127-1**

Applicable standard: **EN1127-1**

SEW-EURODRIVE hinterlegt folgende technische Dokumentation zur Einsicht bei benannter Stelle:

FSA GmbH, EU-Kennnummer 0588

SEW-EURODRIVE will archive the following technical documentation for reference purposes at the following location:

FSA GmbH, EU Code 0588

SEW-EURODRIVE GmbH & Co

Bruchsal, den 09.08.2000

Ort und Datum der Ausstellung

Place and date of issue

ppa

Funktion: Vertriebsleitung / Deutschland

Function: Head of Sales / Germany



Variable speed gear units of category 3G and 3D, VARIBLOC® Series 01-51



SEW
EURODRIVE

Konformitätserklärung

Declaration of Conformity

(im Sinne der Richtlinie 94/9/EG, Anhang VIII)

(according to EC Directive 94/9/EC, Appendix VIII)

SEW-EURODRIVE GmbH & Co
Ernst Blickle Str. 42
D-76646 Bruchsal

SEW-EURODRIVE

erklärt in alleiniger Verantwortung, dass die Verstellgetriebe der Kategorie 3G und 3D der Baureihe VARIBLOC® 01-51, auf die sich diese Erklärung bezieht, mit der

declares in sole responsibility that the variable speed gear drives in categories 3G and 3D of the VARIBLOC® 01-51 series that are subject to this declaration are meeting the requirements set forth in

Richtlinie 94/9/EG

Directive 94/9/EG

übereinstimmen.

Angewandte Norm:

EN1127-1

Applicable standard:

EN1127-1

SEW-EURODRIVE hält die gemäß 94/9/EG geforderten Unterlagen zur Einsicht bereit.

SEW-EURODRIVE will make available the documents required according to 94/9/EG for reference purposes.

SEW-EURODRIVE GmbH & Co

Bruchsal, den 09.08.2000

Ort und Datum der Ausstellung

Place and date of issue

ppa

Funktion: Vertriebsleitung / Deutschland

Function: Head of Sales / Germany



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Assembly Sales Service	Brüssel	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Phone: (010) 23 13 11 Fax: (010) 2313 36 http://www.caron-vector.be info@caron-vector.be
Macedonia			
Sales	Skopje	SGS-Skopje / Macedonia Teodosij Sinactaski" 6691000 Skopje / Macedonia	Phone: (0991) 38 43 90 Fax: (0991) 38 43 90
Malaysia			
Assembly Sales Service	Johore	SEW-EURODRIVE Sdn. Bhd. 95, Jalan Seroja 39 81100 Johore Bahru Johore	Phone: (07) 3 54 57 07 + 3 54 94 09 Fax: (07) 3 5414 04
Netherlands			
Assembly Sales Service	Rotterdam	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085 NL-3004AB Rotterdam	Phone: (010) 4 46 37 00 Fax: (010) 4 15 55 52
New Zealand			
Assembly Sales Service	Auckland	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Phone: (09) 2 74 56 272 74 00 77 Fax: (09) 274 0165 sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 10 Settlers Crescent, Ferrymead Christchurch	Phone: (09) 3 84 62 51 Fax: (09) 3 84 64 55 sales@sew-eurodrive.co.nz
Norway			
Assembly Sales Service	Moss	SEW-EURODRIVE A/S Solgaard skog 71 N-1539 Moss	Phone: (69) 2410 20 Fax: (69) 2410 40
Peru			
Assembly Sales Service	Lima	SEW DEL PERU MOTORES REDUCTORES S.A.C. Los Calderos # 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Phone: (511) 349-52 80 Fax: (511) 349-30 02
Poland			
Sales	Lodz	SEW-EURODRIVE Polska Sp.z.o.o. ul. Pojezierska 63 91-338 Lodz	Phone: (042) 6 16 22 00 Fax: (042) 6 16 22 10 sew@sew-eurodrive.pl
Portugal			
Assembly Sales Service	Coimbra	SEW-EURODRIVE, LDA. Apartado 15 P-3050-901 Mealhada	Phone: (0231) 20 96 70 Fax: (0231) 20 36 85 infosew@sew-eurodrive.pt
Romania			
Sales Service	Bucuresti	Sialco Trading SRL str. Madrid nr.4 71222 Bucuresti	Phone: (01) 2 30 13 28 Fax: (01) 2 30 71 70 sialco@mediasat.ro

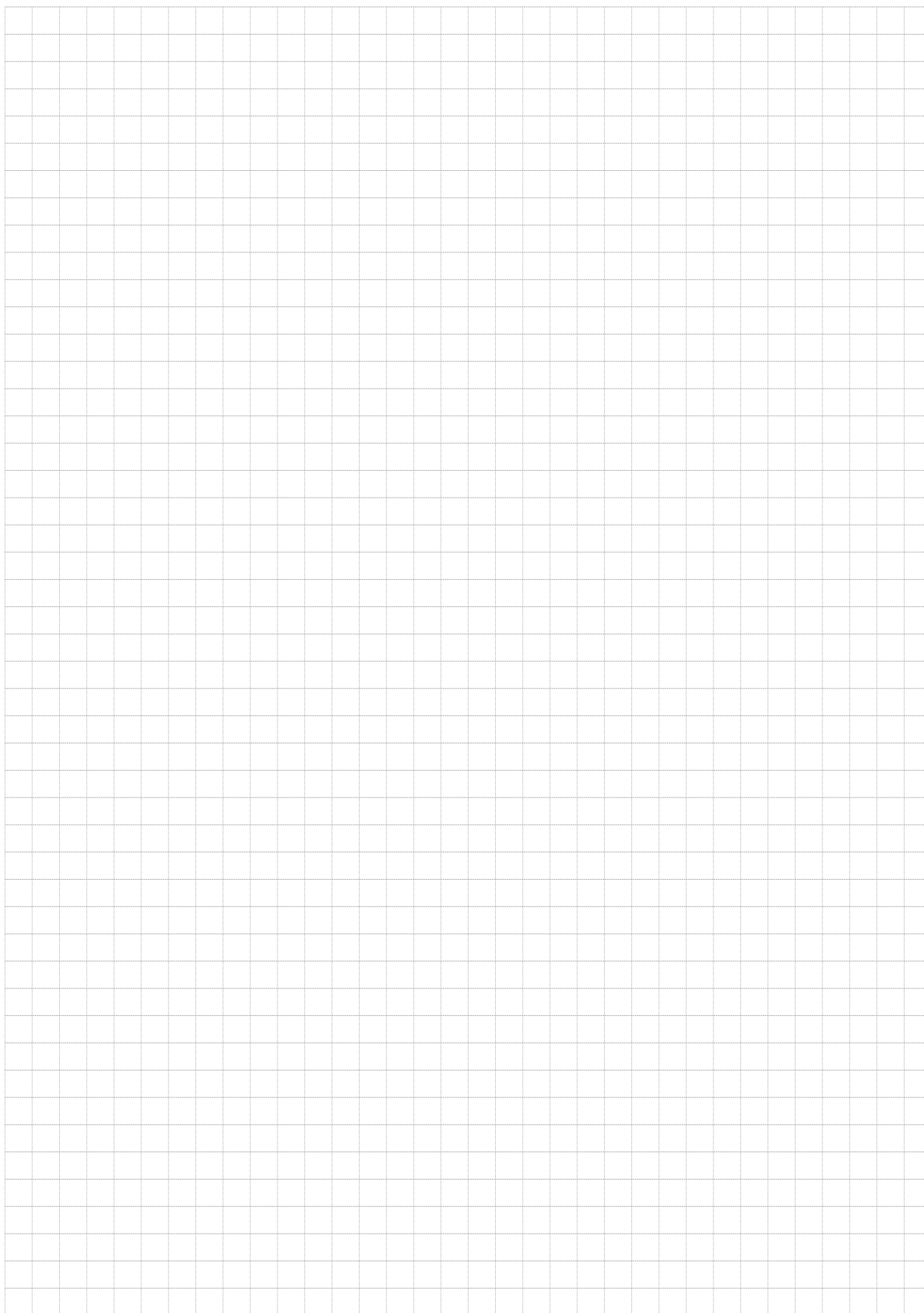


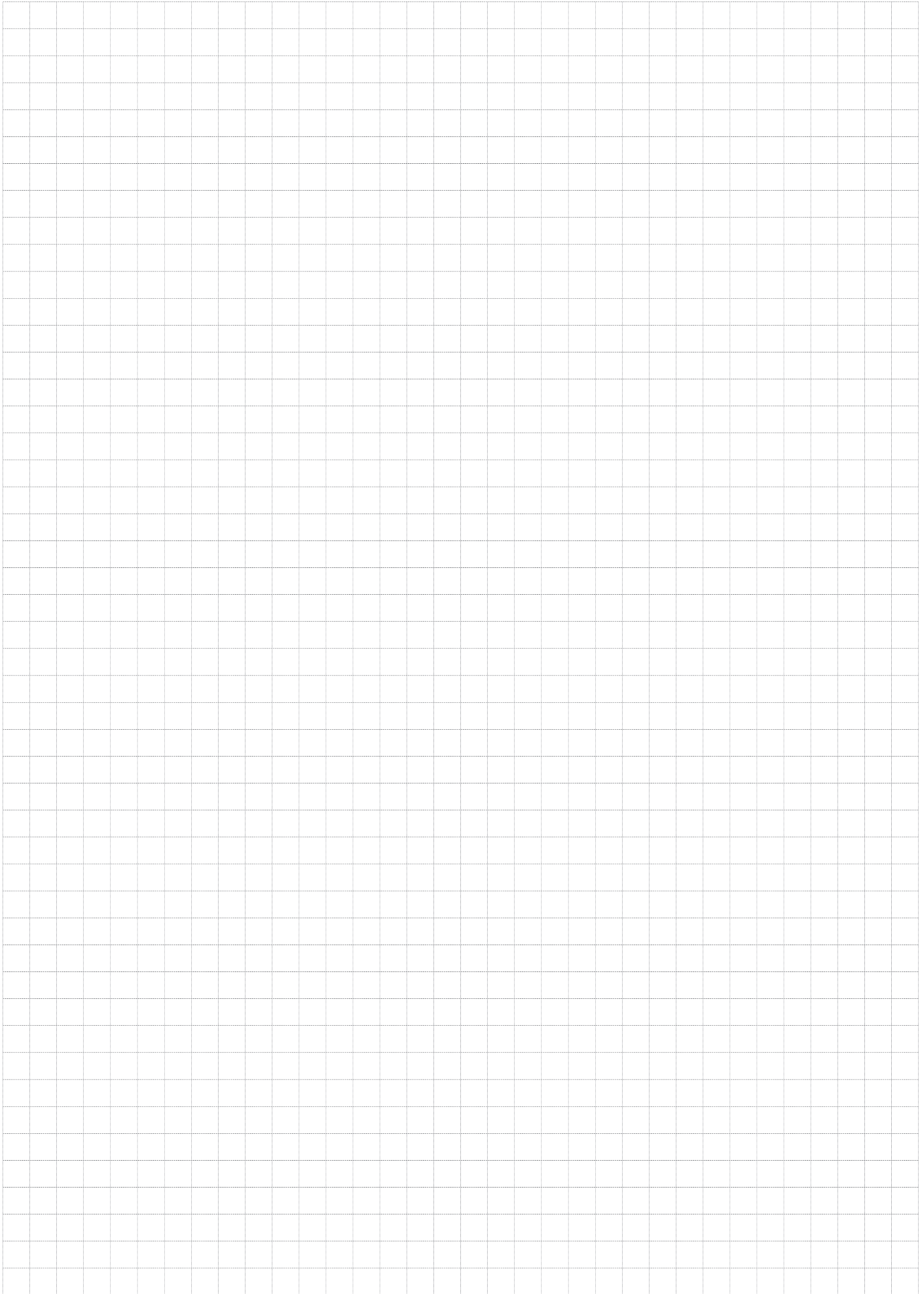
Russia			
Sales	St. Petersburg	ZAO SEW-EURODRIVE P.O. Box 193 193015 St. Petersburg	Phone: (812) 3 26 09 41 + 5 35 04 30 Fax: (812) 5 35 22 87 sewrus@post.spbnet.ru
Singapore			
Assembly Sales Service	Singapore	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 Jurong Industrial Estate Singapore 638644 Jurong Point Post Office P.O. Box 813 Singapore 91 64 28	Phone: 8 62 17 01-705 Fax: 8 61 28 27 Telex: 38 659
South Africa			
Assembly Sales Service	Johannesburg	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2 Johannesburg 2013 P.O. Box 27032 2011 Benrose, Johannesburg	Phone: (11) 49 44 380 Fax: (11) 49 42 300
	Capetown	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens, 7441 Cape Town P.O.Box 53 573 Racecourse Park, 7441 Cape Town	Phone: (021) 5 11 09 87 Fax: (021) 5 11 44 58 Telex: 576 062
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 39 Circuit Road Westmead, Pinetown P.O. Box 10433, Ashwood 3605	Phone: (031) 700 34 51 Telex: 622 407
Spain			
Assembly Sales Service	Bilbao	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 E-48170 Zamudio (Vizcaya)	Phone: 9 44 31 84 70 Fax: 9 44 31 84 71 sew.spain@sew-eurodrive.es
Sweden			
Assembly Sales Service	Jönköping	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping Box 3100 S-55003 Jönköping	Phone: (036) 34 42 00 Fax: (036) 34 42 80 www.sew-eurodrive.se
Switzerland			
Assembly Sales Service	Basel	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein near Basel	Phone: (061) 4 17 17 17 Fax: (061) 4 17 17 00 http://www.imhof-sew.ch info@imhof-sew.ch
Thailand			
Assembly Sales Service	Chon Buri	SEW-EURODRIVE (Thailand) Ltd. Bangpakong Industrial Park 2 700/456, M007, Tambol Bonhwaroh Muang District Chon Buri 20000	Phone: 0066-38 21 45 29/30 Fax: 0066-38 21 45 31
Turkey			
Assembly Sales Service	Istanbul	SEW-EURODRIVE Hareket Sistemleri San. ve Tic. Ltd. Sti Bagdat Cad. Koruma Cikmazi No. 3 TR-81540 Maltepe ISTANBUL	Phone: (0216) 4 41 91 63 + 4 41 91 64 + 3 83 80 14 + 3 83 80 15 Fax: (0216) 3 05 58 67 seweurodrive@superonline.com.tr
Uruguay			
	Please contact our office in Argentina.		



Address list

USA			
Production Assembly Sales Service	Greenville	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Phone: (864) 4 39 75 37 Fax: Sales (864) 439-78 30 Fax: Manuf. (864) 4 39-99 48 Fax: Ass. (864) 4 39-05 66 Telex: 805 550
Assembly Sales Service	San Francisco	SEW-EURODRIVE INC. 30599 San Antonio Road P.O. Box 3910 Hayward, California 94544	Phone: (510) 4 87-35 60 Fax: (510) 4 87-63 81
	Philadelphia/PA	SEW-EURODRIVE INC. Pureland Ind. Complex 200 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Phone: (856) 4 67-22 77 Fax: (856) 8 45-31 79
	Dayton	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Phone: (9 37) 3 35-00 36 Fax: (9 37) 4 40-37 99
	Dallas	SEW-EURODRIVE INC. 3950 Platinum Way Dallas, Texas 75237	Phone: (214) 3 30-48 24 Fax: (214) 3 30-47 24
Additional addresses for service in the USA provided on request!			
Venezuela			
Assembly Sales Service	Valencia	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia	Phone: (041) 32 95 83 + 32 98 04 + 32 94 51 Fax: (041) 32 62 75 sewventas@cantr.net sewfinanzas@cantr.net







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