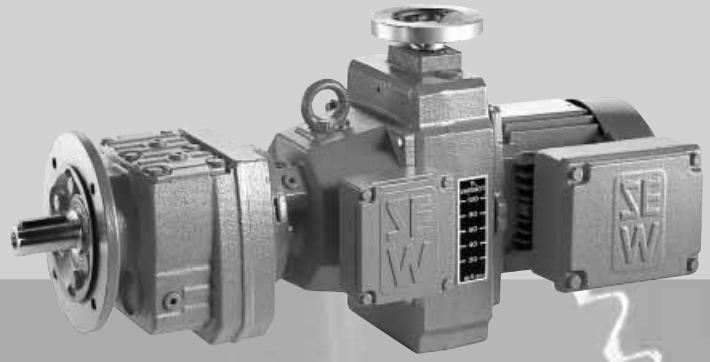
SEW EURODRIVE

Explosion-Protected VARIMOT® Variable Speed Gear Units and Options

Edition

09/2000



Operating Instructions

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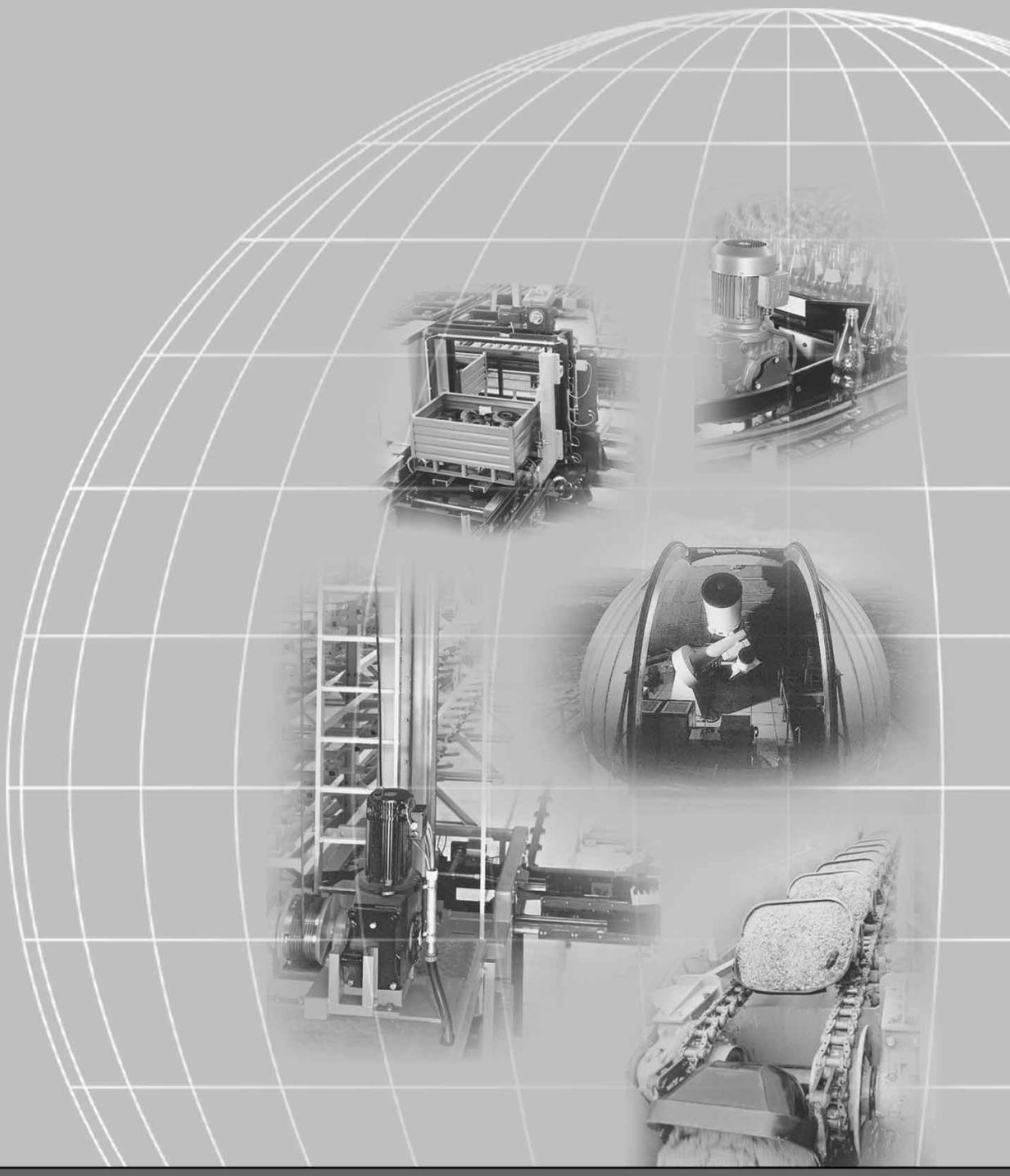

SEW-EURODRIVE

1 Important Notes

Safety and warning instructions

Always follow 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
- Copper

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

2 Safety Notes

2.1 Safety Notes for the Use of VARIMOT®

The following safety instructions 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 notes 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, maintenance and repair work on the VARIMOT® 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 usage

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 4.1 and 4.2).

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

Optional equipment

It complies with existing standards and regulations.

- EN 50014
- EN 50018 for protection type "d"
- EN 50019 for protection type "e"
- EN 50020 intrinsically safe "i"
- EN 50281-1-1 / EN 50281-1-2 "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 operated in potentially explosive atmospheres"
- EN 50281-1-1 "Electrical equipment for use in atmospheres with combustible dust"
- DIN VDE 105-9 "Operating electrical systems" or other national regulations
- DIN VDE 0100 "Setup 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 VARIMOT® in Explosion-Protected Design

3.1 Unit design

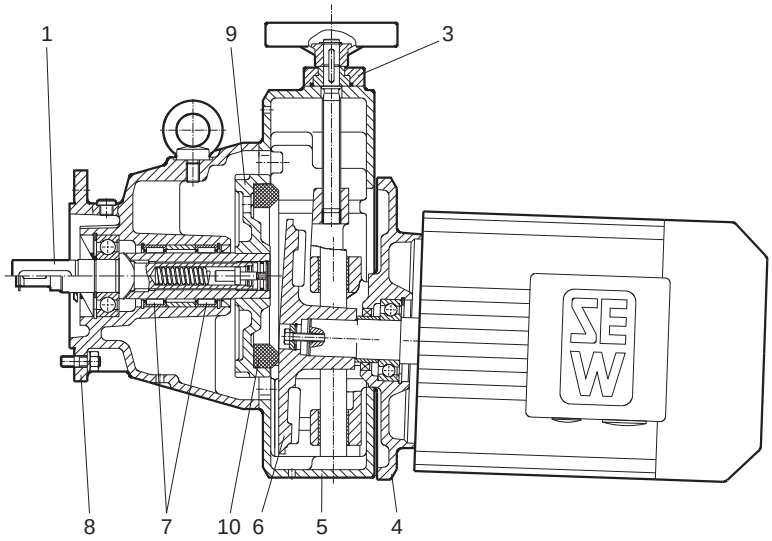

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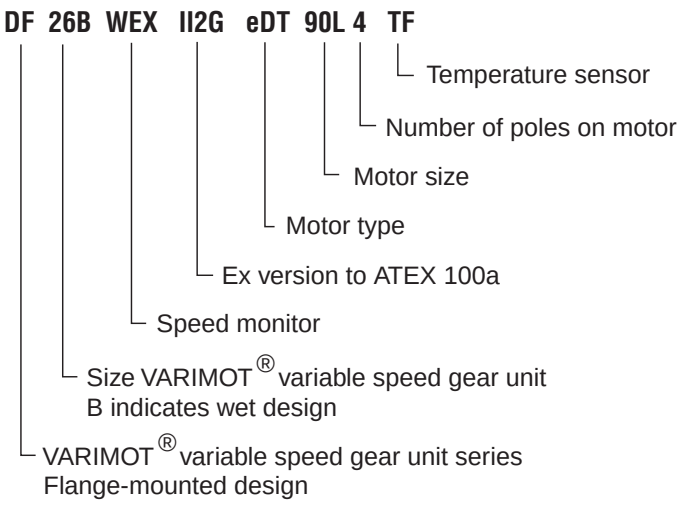
Figure 1: VARIMOT® in explosion-protected design

1 Output drive shaft, complete
3 Plate
4 Adjustable plate
5 Cover
6 Drive disc
7 Needle bearing
8 Housing with tapped hole
9 Hollow shaft, complete
10 Friction ring

3.2 Type designation

Example



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3.3 Overview of mounting options

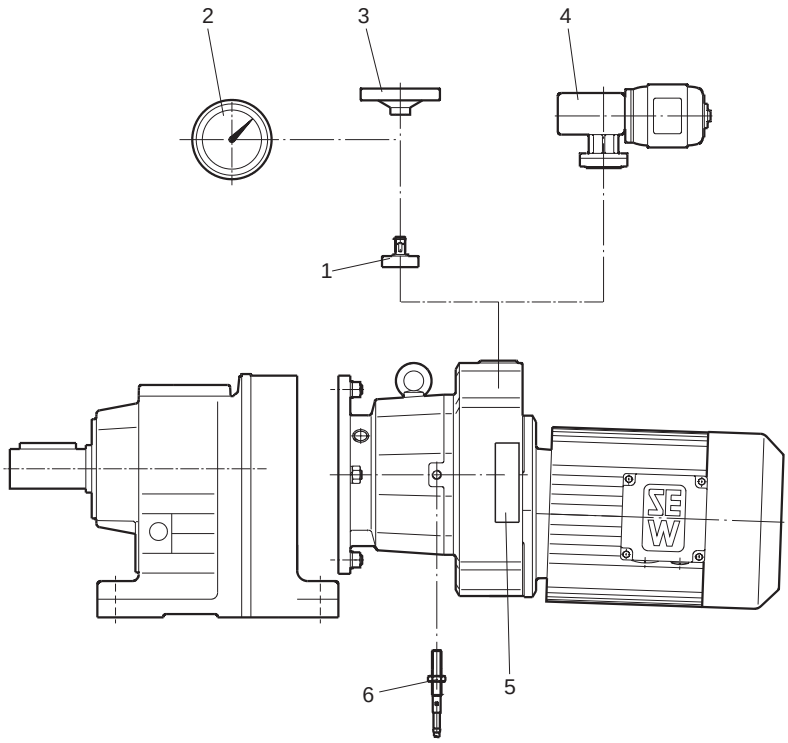

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Figure 2: Overview of mounting options

1 Adjustment device with free shaft end NV
2 Adjustment device with handwheel and position indication HS
3 Adjustment device with handwheel H (standard design)
4 Electromechanical remote speed adjustment EFEX
5 Display scale
6 Voltage encoder IGEX

4 Setup

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

4.1 VARIMOT® in category 2G

General notes

- SEW's explosion-proof variable speed gear units of **VARIMOT® series D/DF 16-46 and VARIMOT® series D/DF 16-46B** meet the design requirements of **unit group II, category 2G** (gas explosion atmosphere). They are intended for use in **zones 1 and 2**.
- Standard feature of SEW's explosion-proof variable speed gear units of the VARIMOT® series is a tapped hole for installation of a voltage encoder.

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 operation of variable speed gear units.

Temperature class

- VARIMOT® 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.

Ambient temperature

- VARIMOT® variable speed gear units 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

- VARIMOT® variable speed gear units of category 2G may only be started up with functioning 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 VARIMOT® in category 3G and 3D

General notes

- SEW's explosion-proof variable speed gear units of the **VARIMOT® series D/DF 16-46 and VARIMOT® series D/DF 16-46B** meet the design requirements of unit group II, **category 3G** (gas explosion atmosphere) and **3D** (dust explosion atmosphere). They are intended for use in **zone 2 and zone 22**.
- Standard feature of SEW's explosion-proof variable speed gear units of the VARIMOT® series is a tapped hole for installation of a voltage encoder.

Temperature class

- VARIMOT® variable speed gear units of category 3G (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 maximum surface temperature for VARIMOT® variable speed gear units of category 3D (dust explosion atmosphere) is 200° C. The operator of the facility must ensure that a possible dust accumulation with a thickness of 5 mm in acccordance with EN 50281-1-2 will not be exceeded.

Ambient temperature

- VARIMOT® variable speed gear units may only be used at an ambient temperature of –20 °C to +40 °C.

Output power and output torque

- Maintain nominal values for output power or output torque.

If an overload condition of the VARIMOT® as a unit of catgory 3G or 3D cannot be ruled out, a VARIMOT® 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 entries on the nameplate of the drive match the supply voltage
- the drive is not damaged (no damage resulting from transport or storage)
- the following requirements have been properly met:
  - ambient temperature between -20 °C and +40 °C,
  - no oils, acids, gases, vapors, radiation, potentially explosive atmospheres, etc.
- the enclosure type has been verified.

4.4 Preliminary work

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 – 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.

Anti-friction bearing grease

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

4.5 Setup

- The variable speed geared motor may be mounted or installed only in the specified position on a level[1)], vibration-free and torsionally rigid support structure. Do not tighten housing legs and mounting flanges against each other.

Please note:

- VARIMOT® 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 at the lowest position must be removed prior to operation (danger of corrosion!)**
- 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.
- 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.

Installation in damp areas or in the open

- VARIMOT® gear units are supplied in corrosion-resistant versions (design B) for use in damp areas or in open air. Any damage to the paintwork (e.g. on the breather valve) must be repaired.

Cable entry, screw-type conduit fitting

- 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.
- Coat the threads of the cable screw fittings and the 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.

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

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 • 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 according to DIN 42948 • 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 couplings 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.

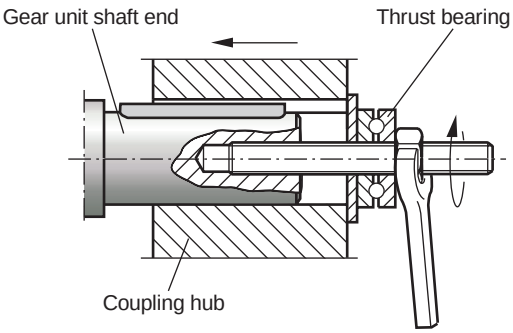

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Figure 3: Example of a fitting tool

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

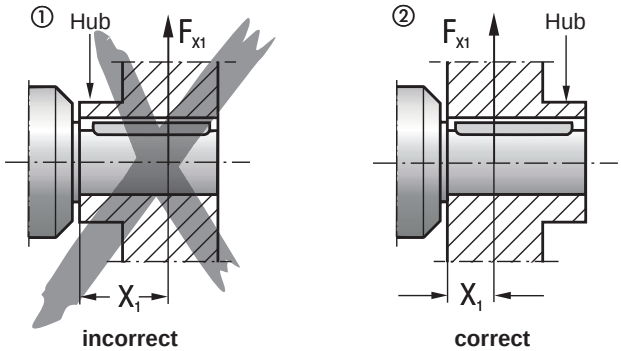

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Figure 4: Correct mounting arrangement of a gear or sprocket wheel

- Mounting of input and output elements with mounting device only (see Figure 3). Use center bore with thread on shaft end for positioning purposes.

- 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 "Geared Motors" catalog).
- **Never mount belt pulleys, couplings, 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).**

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:

a) Maximum and minimum clearance

b) Axial offset

c) Angular offset

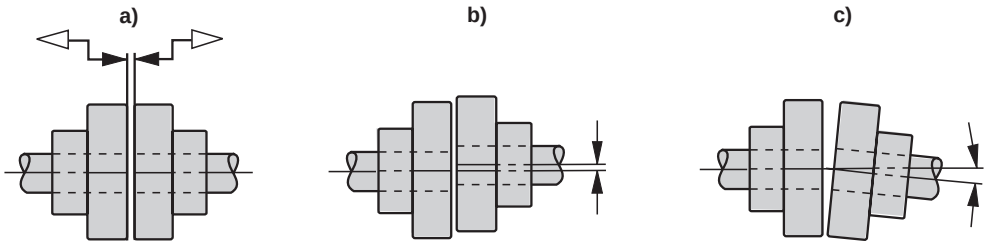

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Figure 5

Input and output elements such as belt pulleys, couplings 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 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).

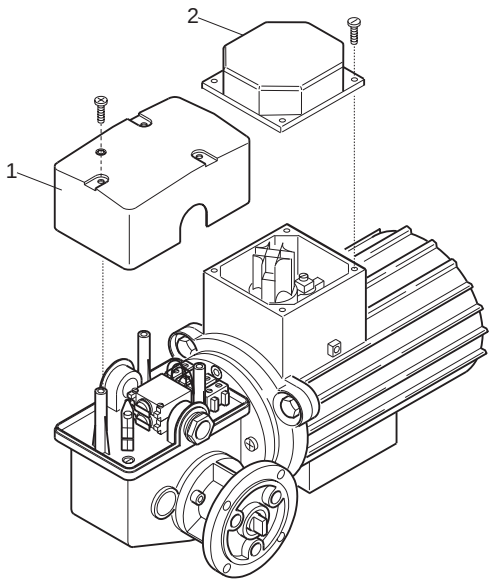

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Figure 6: EFEX servomotor

Limiting the speed range for EFEX

The operating cams for the limit switches are factory set so that 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 category 2G without speed monitoring!

Standard design

The standard design of the VARIMOT® explosion-proof variable speed gear unit features an M14x1 tapped hole (VARIMOT® D16/26, design with terminal strips in the terminal box) or an M18x1 tapped hole (VARIMOT® D36/46, design with connectors) that will accept a voltage encoder in the gear case of the variable speed gear unit. Speed monitor and voltage encoder must be supplied and installed by the user 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 for VARIMOT® D16/26:

Manufacturer:	Pepperl + Fuchs, Mannheim
Type:	NJ2-11-N-G according to DIN 19234 (NAMUR), 100 mm cable
Housing:	M14x1
PTB no.:	83/2022X

Voltage encoder in WEXA/WEX/IGEX design for VARIMOT® D36/46:

Manufacturer:	Pepperl + Fuchs, Mannheim
Type:	NJ5-18-N-V1according to DIN 19234 (NAMUR), M12x1 plug connector
Housing:	M18x1
PTB no.:	Ex-95D2086X

All installation and adjustment notes given below refer to the speed monitor or voltage encoder in 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.

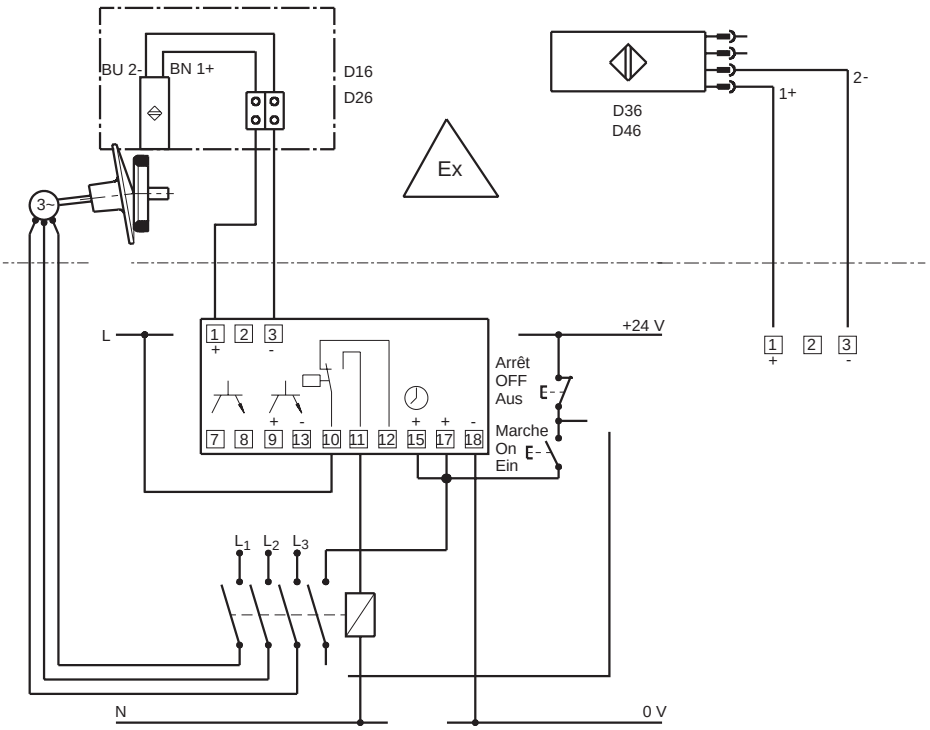

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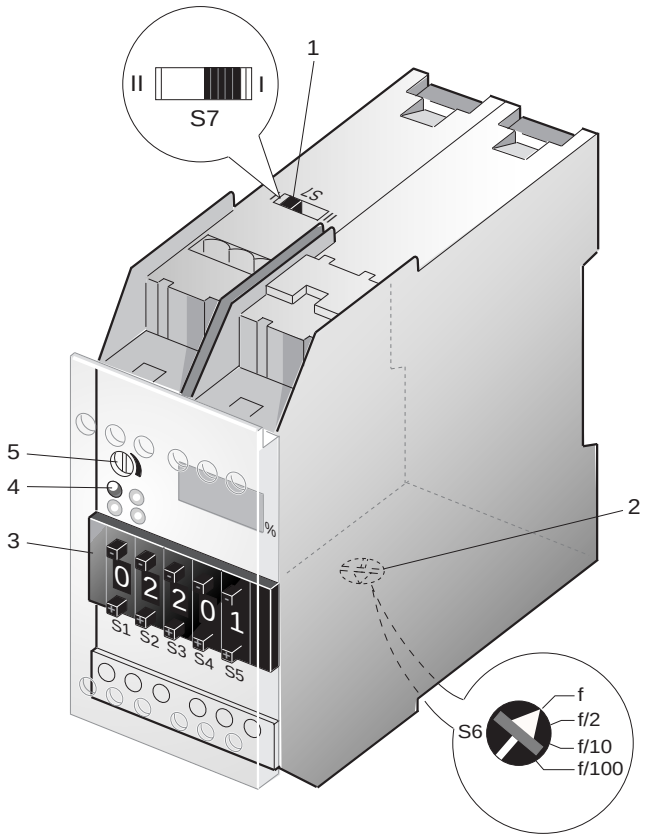
Figure 7: Connecting WEXA/WEX speed monitor to VARIMOT® D16/26 or D36/46

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.



1 Slide switch S7
2 Rotary switch S6
3 Numeric rotary switches S1 – S5
4 LED yellow

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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
LED yellow	Front side of unit	-	Signal of voltage encoder
Spindle-operated potentiometer	Front side of unit	3 seconds	Starting bypass

Table 1: Basic setting of speed monitor

The starting bypass time may not exceed 3 seconds. This setting must be carefully executed and verified by 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
D / DF16 D / DF16B	4	50	0	3	0
	6			1	9
	8			1	6
	4	60	0	3	7
	6			2	4
	8			1	8
D / DF26 D / DF26B	4	50	0	3	3
	6			2	2
	8			1	6
	4	60	0	4	0
	6			2	5
	8			2	0
D / DF36 D / DF36B	4	50	0	3	0
	6			1	9
	8			1	4
	4	60	0	3	5
	6			2	3
	8			1	7
D / DF46 D / DF46B	4	50	0	3	6
	6			2	0
	8			1	8
	4	60	0	4	4
	6			2	9
	8			2	2

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 18), 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 stopped for at least 15 minutes. If a wrong operation by the operating personnel cannot be ruled out, this break interval should be brought about by an automatically operating restart lock.

If vibrations or increased operating noises are noticeable after restarting the variable speed gear unit, the friction ring was damaged during the blocking and must be replaced ("Replacing the friction ring" on page 25).

The starting bypass time may not exceed 3 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]
D / DF16 D / DF16B	4	50	300	6	30,0
	6		194		19,4
	8		150		15,0
	4	60	375		37,5
	6		240		24,0
	8		187		18,7
D / DF26 D / DF26B	4	50	329		32,9
	6		211		21,1
	8		159		15,9
	4	60	403		40,3
	6		258		25,8
	8		202		20,2
D / DF36 D / DF36B	4	50	296		29,6
	6		194		19,4
	8		142		14,2
	4	60	356		35,6
	6		237		23,7
	8		178		17,8
D / DF46 D / DF46B	4	50	363		36,3
	6		243		24,3
	8		183		18,3
	4	60	441		44,1
	6		294		29,4
	8		221		22,1

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

Installation/ connection of the IGEX voltage encoder

1. Rotate the output shaft of the variable speed gear unit until the treated cast-metal surface of the friction ring carrier can be seen through the tapped hole in the gear case.
2. Voltage encoder:
   - carefully screw it into the tapped hole of the variable speed gear case until the voltage encoder (3) rests on the friction ring carrier
   - turn it back one turn and secure it with lock nut (2)

This sets the switching interval x as follows:

- for VARIMOT® D16/26 to 1 mm
- for VARIMOT® D36/46 to 2 mm

During operation, the voltage encoder supplies six pulses per revolution at this switching interval.

3. The voltage encoder is connected to the WEX speed monitor as follows:
   - VARIMOT® D16/26 via terminal strips in the terminal box (Figure 9, left)
   - VARIMOT® D36/46 via connectors (Figure 9, right)

Changing switching interval x

If no circuit state change occurs at the voltage encoder with rotating shaft of the variable speed gear unit operating with switching interval x, the switching interval can be changed (Figure 9). The circuit state change is indicated by the yellow LED at the front side of the speed monitor (Page 17, Figure 8, Position 4).

1. With **constantly lit yellow LED** at the speed monitor, turn the voltage encoder half a turn counterclockwise at a time and check its function.
2. If the **yellow LED is not lit** on the speed monitor, turn the voltage encoder **no more than two times** (D16/26) **or six times** (D36/46) by 90 degrees in clockwise direction.

Do not turn the voltage encoder more than half a turn (16/26) or one and a half turns (D36/46) into the tapped hole since the encoder would be destroyed by the collisions with the recesses of the friction ring carrier throughout the rotations.

3. If there is still no circuit state change, check the voltage supply of the voltage encoder using the evaluation electronics (with WEX design).

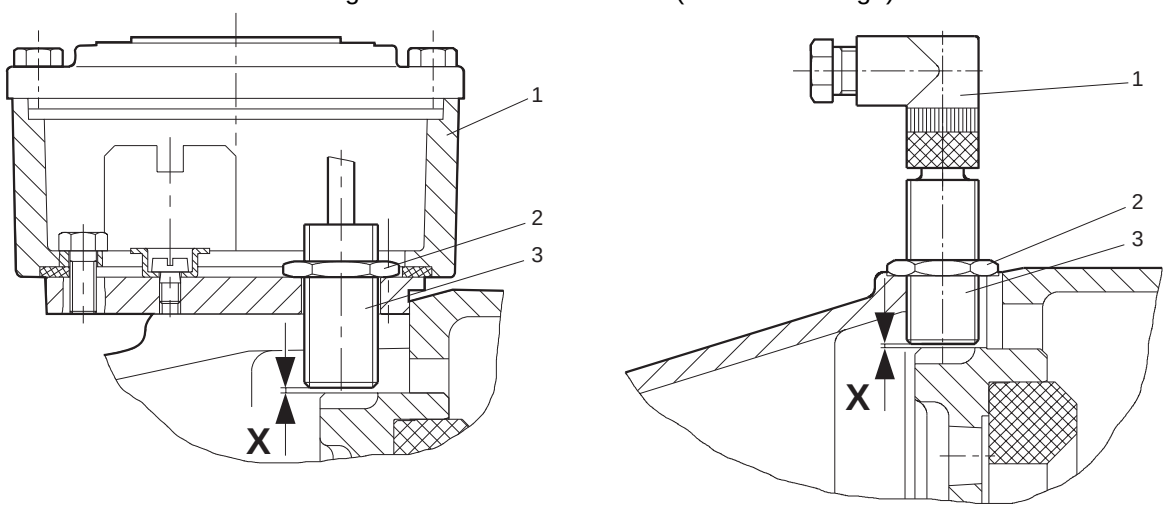


Figure 9: Installation of voltage encoder and setting of switching interval x
left: for VARIMOT® D16/26 via terminal strips in the terminal box (1)
right: for VARIMOT® D36/46 via plug connectors (1)

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.

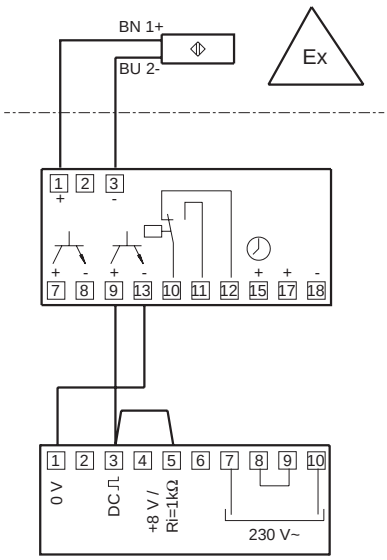
Technical data

Manufacturer:	Dr. Horn
Type:	HDA 4110-50
Display unit:	digital
Power supply:	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 10).



Speed monitor type KFD2-DW-Ex1.D made by Pepperl + Fuchs

Contactless digital remote speed indicator, type HDA 4110-50 made by Dr. Horn

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Figure 10: 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 11 and "Calculation examples digital remote speed indicator" on page 22)
   - Calculation using a formula
   - Data according to Table 4
4. Adjust input sensitivity (Figure 11):
   - Turn potentiometer "input sensitivity" clockwise until pulse indicator light starts to light up

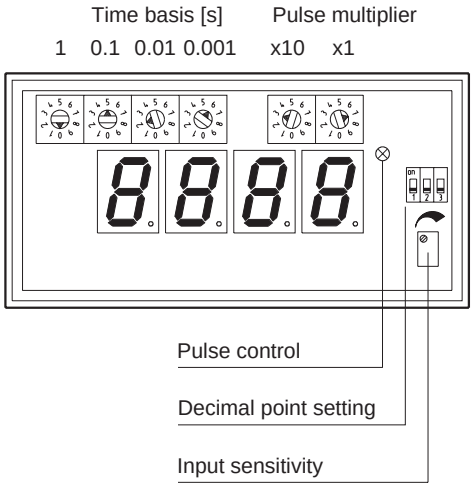

Figure 11: Adjusting the digital remote speed indicator

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 VARIMOT®	Pulses / revolution	VARIMOT® reference speed [rpm]		
		4-pole	6-pole	8-pole
D 16	6	1690	1065	833
D 26		1825	1200	885
D 36		1675	1080	825
D 46		1610	1073	850

Table 4: Reference data of digital remote speed indicator

Calculation examples digital remote speed indicator

	Example 1	Example 2
Drive	R107R77D36/WEXA/II2G eDV112M4	R107R77D36/WEXA/II3G eDV112M4
Data	Output speed n_a = 1.5 -7.5 Pulses / revolution z = 6 (Table 4) max. speed of variable speed gear unitn = 1675 rpm (Table 4)	Output speed n_a = 1.5 -7.5 Pulses / revolution z = 6 (Table 4) max. speed of variable speed gear unit n = 1675 rpm (Table 4)
Desired indication	Output speed A = 1.500 – 7.500 rpm	Strip speed A = 0.5 . 2.5 m/min
$\frac{60 \cdot A}{n \cdot k \cdot z \cdot f}$	$\frac{60 \cdot 7500}{1675 \cdot 1 \cdot 6 \cdot 1} = 44,78s$	$\frac{60 \cdot 2500}{1675 \cdot 1 \cdot 6 \cdot 1} = 14,925s$
Recomm. measuring interval	0.5 - 2 s (max. 9.999 s)	
Calculation with new pulse multiplier	k = 50 $Measuringinterval = \frac{60 \cdot 7500}{1675 \cdot 50 \cdot 6 \cdot 1} = 0,896s$	k = 10 $Measuringinterval = \frac{60 \cdot 2500}{1675 \cdot 10 \cdot 6 \cdot 1} = 1,493s$
Device setup	Measuring interval: [0] [8] [9] [6] Pulse multiplier: [5] [0] Decimal point setting:1	Measuring interval: [1] [4] [9] [3] Pulse multiplier: [1] [0] Decimal point setting:1

6 Inspection / Maintenance

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

6.1 Inspection and maintenance intervals

Unit / Component	Interval	What to do?	Details on page ...
VARIMOT®	**As required**	Eliminate dust accumulation > 5 mm through cleaning	
VARIMOT®	**Weekly**	Pass through speed range	
VARIMOT®	Every **3000** operating hours, at least **every six months**	• Check torsional play • Check bearing; poss. clean, grease • Check oil seals and replace with original SEW spare parts in case of heavy wear • Check running noise / temperature of anti-friction bearing Interior of variable speed gear unit: • Check for dust accumulation • Remove existing dust deposit	see "Check torsional play" on page 24 see "Measure temperature of anti-friction bearing" on page 26
VARIMOT®	Every **6000** hours of operation	Replace friction ring	see "Replacing the friction ring" on page 25
VARIMOT®	Every **10000** hours of operation	Replace bearing	
EFEX	Every **20 000** variations At least **every six months**	Check adjusting spindle • replace, if necessary • otherwise lubricate	

6.2 Before you begin

Required tools

- Wrench set
- Hammer
- Mandrel or drift punch
- Hand lever press

6.3 Inspection / maintenance of VARIMOT®

- **Service and maintenance of SEW variable speed gear units in category 2G, 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 variabe speed drive will become void.**
- **Disconnect the variable speed drive from the power supply and protect against unintentional re-start!**

Check torsional play

The torsional play of the output shaft is increased through wear of the friction ring. The torsional play can be checked as follows:

1. Remove fan cover of drive motor
2. Adjust output to speed ratio 1:1 (approximately value "80" on the display scale of the position indication, compare Figure 2 on page 5)
3. Check torsional play:
   - at the motor fan blade
   - with stationary input shaft
4. Torsional play > 45 °:
   - Check the friction ring (see "Checking the friction ring" (Figures 13 and 14) on page 24)

Checking the friction ring (Figure 13 and Figure 14)

1. Loosen all fastening screws (2)
2. Disconnect drive between housing cover (5) and housing (8)
3. Check friction ring
   - if chamfers are visible: friction ring is OK
   - if friction ring is damaged or chamfer is abraded: replace friction ring (see "Replacing the friction ring" on page 25)

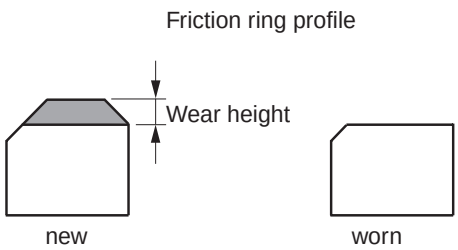

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Figure 12: Checking the friction ring

Replacing the friction ring

1. Disassemble the voltage encoder
2. Pull complete hollow shaft (9) off housing (8)
3. Remove friction ring (10) from hollow shaft using hammer and mandrel or drift punch
4. Place new friction ring on a clean, level base
5. Place complete hollow shaft on friction ring
   – pre-center via friction ring offset
6. Press hollow shaft and friction ring together using slight pressure (if possible, use hand lever press) until stop is reached
7. Lubricate needle bearing (7) with anti-friction bearing grease

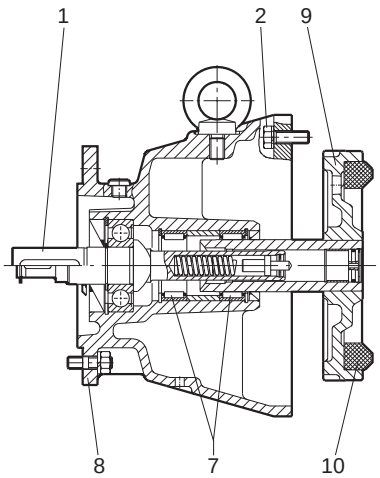

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Figure 13: Checking/replacing friction ring

8. Clean bearing surface:
   – for friction ring:
     use dry paper or cloth
   – for drive disc (6):
     use degreasing cleaning agent
9. Push complete hollow shaft with friction ring into the housing
   – turn the hollow shaft during insertion until cam lines are engaged (do not turn hollow shaft any further)
   – carefully join housing and housing cover; tighten evenly
10. Check torsional play at output shaft:
    – correct: minor torsional play can be detected
11. Install voltage encoder
12. Switch on varibale speed geared motor:
    – slowly pass through the speed range
    – correct: drive runs noise-free and vibration-free

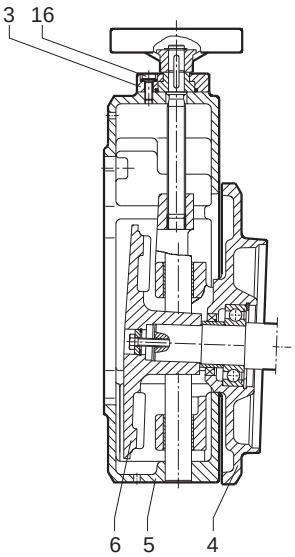

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Figure 14: Checking/replacing friction ring

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 temperature of the anti-friction bearing at the test points T1 and T2 (Figure 15) does not exceed 100 °C.

If this value is exceeded, the corresponding anti-friction bearing must be replaced.

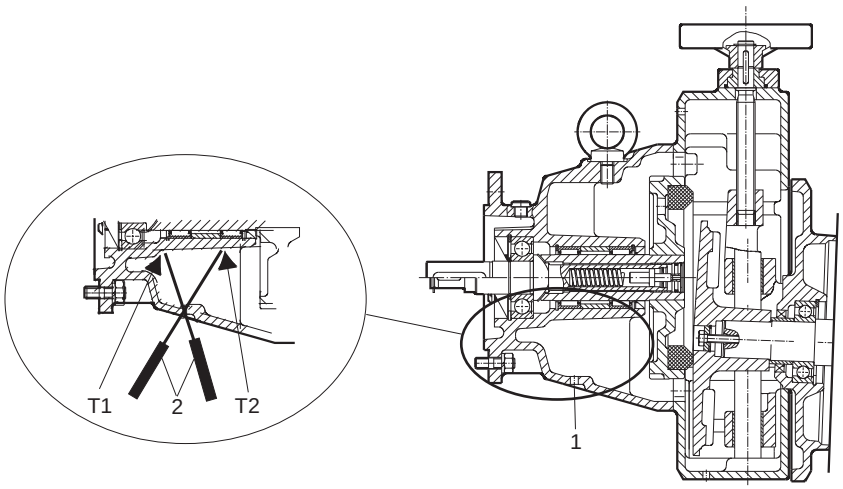

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Figure 15: Measuring the temperature of the anti-friction bearing

The temperature of the anti-friction bearing can be measured with commercially available temperature sensors. Note: Use only temperature sensors with a maximum diameter of 4 mm (condensation drain hole)!

1. The bearing temperature may **only be measured during standstill**.
2. Insert the temperature sensor (2) into the condensation drain hole (1) immediately after the variable speed gear unit comes to a standstill.
   – Depending on the variable speed gear unit type, the condensation drain hole has the following diameter:

Variable speed gear unit type	∅ Condensation drain hole
D 16	6.6 mm
D 26	9 mm
D 36	6 mm
D 46	6 mm

3. Measure the bearing temperature at test points T1 and T2. If the bearing temperature exceeds 100 °C at one of the test points, replace the affected anti-friction bearing.

6.4 Inspection / maintenance of optional equipment

Relubricate EFEX adjustment spindle

1. Disassemble variable speed motor (11) and intermediate flange (12)
2. Remove adjusting spindle (13) from drive by turning it clockwise
3. Lubricate adjustment spindle (13) with well-adhering lubricant, e. g. "Never Seeze normal."
4. Assemble in reverse order.

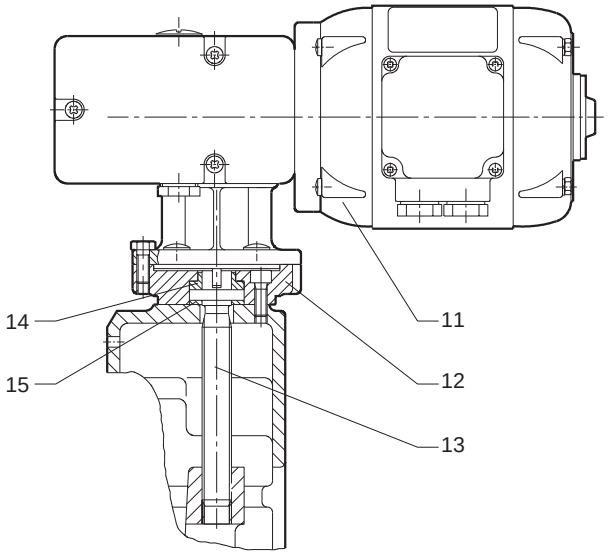

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Figure 16: Relubricating the EFEX adjustment spindle

6.5 Finalizing the inspection / maintenance process

- **After service and maintenance work has been done, ensure that the variable speed drive is assembled correctly and all openings have been plugged.**
- **Perform a safety and function check after all service and maintenance work.**

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 VARIMOT® variable speed gear unit

Fault	Possible cause	Solution
Drive slips or speed monitoring is triggered	Friction ring is worn	Replace friction ring (Section "Replacing the friction ring" on page 25)
	Friction ring or face of drive disc is contaminated	• Replace friction ring with original SEW spare part (Section "Replacing the friction ring" on page 25) • Clean drive 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	Friction ring is damaged **Note:** Damage can occur e. g. • after brief stalling of the drive • with impulse loading of the drive	1. Correct cause 2. Replace friction ring with original SEW spare part (Section "Replacing the friction ring" on page 25)
Rated motor power is not transferred	Speed range is too small	Increase speed range

7.2 Malfunction of optional equipment

EFEX electro-mechanical 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: • Observe manufacturer's documentation! • Voltage encoder is not suitable for connection to the evaluation electronics (IGEX design) • Exchange voltage encoder
LED at voltage encoder is not lit or is lit constantly	Switching interval is too large or too small	Set swiching interval (Section "Changing switching interval x" on page 19)
No display	• Display unit is not properly connected • Voltage supply is missing or interrupted	• Connect display unit correctly in accordance with circuit diagram • Check voltage supply in accordance with circuit diagram
Incorrect display	Display unit is not properly adjusted	Check settings in accordance with Section "Setting data" on page 21

7.3 Statement of Conformity

Variable speed gear unit in category 2G, VARIMOT® Series 16-46

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

Konformitätserklärung

Declaration of Conformity

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

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

SEW-EURODRIVE erklärt in alleiniger Verantwortung, dass die Verstellgetriebe der Kategorie 2G der Baureihe VARIMOT® 16-46 auf die sich diese Erklärung bezieht, mit der

declares in sole responsibility that the variable speed gear drives in categorie 2G of the VARIMOT® 16-46 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 die gemäß 94/9/EG Anhang VIII geforderten Unterlagen bei benannter Stelle:

FSA GmbH, EU-Kennnummer 0588

SEW-EURODRIVE *will archive the documents required according to 94/9/EG 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 in category 3G and 3D, VARIMOT® Series 16-46

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

Konformitätserklärung

Declaration of Conformity

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

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

SEW-EURODRIVE erklärt in alleiniger Verantwortung, dass die Verstellgetriebe der Kategorie 3G und 3D der Baureihe VARIMOT® 16-46, 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 VARIMOT® 16-46 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	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 Bonhuaroh 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
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	Please contact our office in Argentina.		

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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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