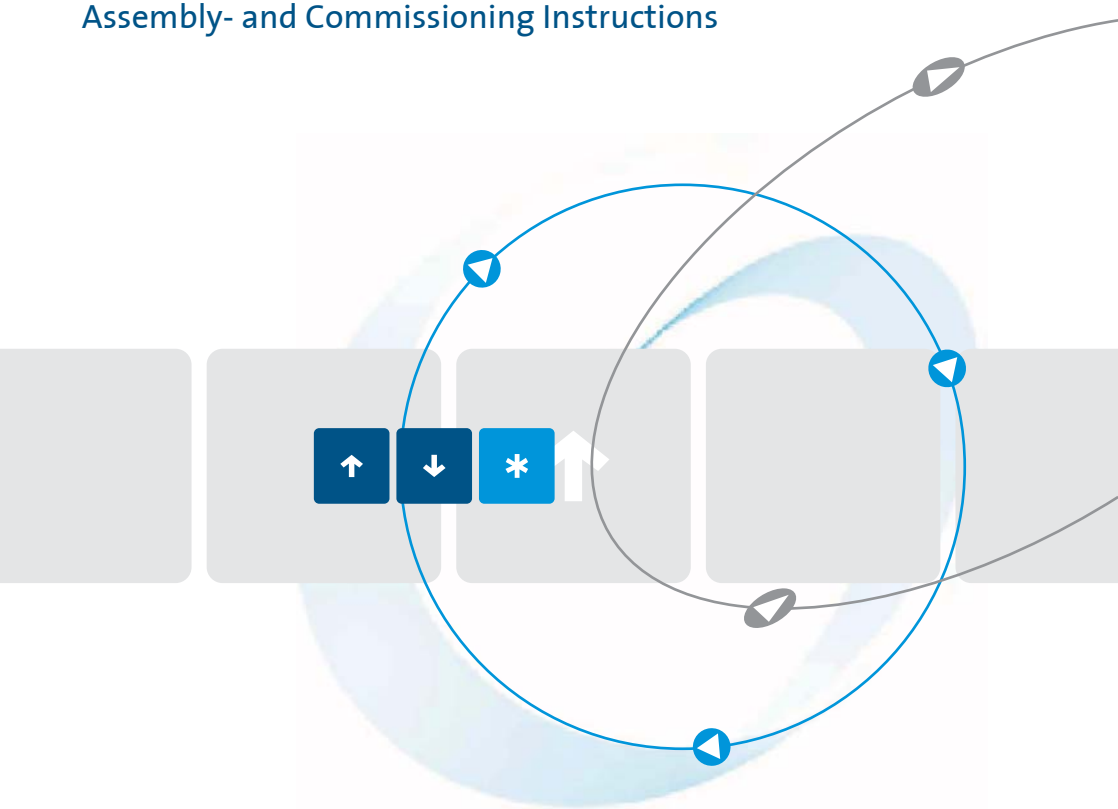
PETER electronic

Safety Frequency Monitor
VersiSafe Speed
Assembly- and Commissioning Instructions



Quality is our Drive.

as per 01/26 17810.10001

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These commissioning instructions were prepared with great care. Nevertheless, PETER electronic GmbH & Co. KG does not assume liability for damage resulting from mistakes possibly contained in this manual. Technical changes that serve to improve the product are subject to change without notice.

Disposal Instructions

Equipment containing electrical components may not be disposed of together with domestic waste. It must be collected separately as electrical and electronic waste according to local and currently valid legislation.

Notes and symbols used in these instructions

Note: Notes explain the advantages of certain adjustments or settings and help you to make use of the device in the best possible way.

Warning notices: Read them carefully and follow them strictly!

Warning notices are indicated in order to protect you against danger or to help you to prevent the device from being damaged.

Caution: Danger to life through electric shock!

When you see this sign, always make sure that the device is de-energized and secured against unintentional energizing.

1. Safety remarks

Installation and setup of the VersiSafe Speed must only be carried out by well trained staff, with knowledge about all relevant standards for safety, accident avoidance and control circuits. This manual must be read and understood before installation and setup.

The product hereby described was developed to perform safety functions as a part of a whole installation or machine. A complete safety system normally includes sensors, evaluation units, signals and logical modules for safe disconnections. The manufacturer of the installation or machine is responsible for ensuring proper functioning of the whole system.The supplyer cannot guarantee all the specifications of an installation or machine that was not designed by the suppler. The total concept of the control system into which the device is integrated must be validated by the user.The supplyer also takes over no liability for recommendations which are given or implied in the following description. The following description implies no modification of the general terms of delivery, warranty or liability claims.

The unit should be panel mounted in an enclosure rated at IP 54 or superior. Dust and dampness may lead to malfunction.

Risk of fire or other thermal hazards!

The device may only be used for the applications described in the mutually applicable operating instructions / data sheet. The notes in the respective documentation must be heeded. The permissible ambient conditions must be observed. In particular, the current limit curve must be heeded.

2. Conformity

In industrial linguistic usage the Safety Standstill Monitor of the type series VersiSafe Speed are called "devices", however, in the sense of the "device-safety-law", the "EMC-law" or the "EC machinery directive" they are not devices or machines ready for use or connection but they are components. It is only possible to define their final function, when these components are integrated into the design and construction of the user.

To be able to use the devices to their intended purpose, it requires power supply networks according to DIN EN 50160 (IEC38).

The user takes the responsibility that the user’s design and construction comply with the applicable legal provision.

The commissioning is strictly forbidden as long as the conformity of the final product with the guideline 2006/42/EC (Machinery directive) is not proved.

3. Product Description

The safety frequency monitor is used for safe frequency monitoring of AC voltages, as well as for detecting the phase sequence and thus monitoring the direction of rotation. It is used to monitor the output frequency of inverters or the rotor frequency of slipring motors. An other application area is the moni-toring of motors in crane plants. Using the front side display the parame-ters can be easily and comfortably adapted to the individual application or changed when necessary.

4. Designated Use

The UH 6937 Frequency Monitor serves the secure recognition and/or supervision of over- and under-frequencies or for the supervision of a set frequency window. The detection of the frequency is enabled via the frequency measuring inputs: E1a, E1b, E2L, E2H, E3L and E3H. The frequency (revolution) ranges, the supervisory function and other parame-ters are to be set by the user on the front display and can be adjusted to suit a variety of applications.

When used in accordance with its intended purpose and following these operating instructions, this device presents no known residual risks. Non-observance may lead to personal injuries and damages to property.

Your Advantage

- For frequency monitoring up to PL e / Cat. 4 and SIL 3
- For direction of rotation monitoring up to PL d / Cat. 2 and SIL 2
- Simple and time saving setup without PC
- Comfortable, menu guided configuration via frontside display
- Reduction of system downtime through extensive diagnostic functions
- easy to integrate into existing drive solutions
- for frequency converters up to 700 Hz
- multilingual: English, German, French

Warning!

- The safety functions used (frequency monitoring and/or direction of rotation monitoring) must be checked and triggered when the device is commissioned.
- Permanent switching back and forth between the frequency modes (always immediately after the switchover time has expired) can result in the device behaving as with the muting function, i.e. the speed monitoring is bridged and the output relays are switched through permanently.
- If the duration of the rotary movement is always shorter than the set discrepancy time, a check is required after 24 hours or before restarting the system to determine whether the measuring frequencies are being recorded correctly.

5. EC Declaration of Conformity

EC Declaration of Conformity CE

The manufacturer / company placing the product on the market
(authorized representatives of the manufacturer / companies placing the product on the market that are established within the Community)

Name / Address: PETER electronic GmbH & Co. KG
Bruckäcker 9
92348 Berg

hereby declares that the following product (device, component, unit) in the version as supplied

Product designation:	**Safety Frequency Monitor**
Series / type designation:	VersiSafe Speed
Article number:	27810...
Year of manufacture:	2017

complies with the provisions of the following EU-directives:

2014/30/EU	Electromagnetic compatibility
2006/42/EG	Machinery Directive
2011/65/EU	RoHS-Directive

The following harmonized standards have been applied:

Basis of Testing	**EN ISO 13849-1:2015**	**EN 61800-5-2:2017 (i. extracts)**
	IEC 61508 Parts 1-7:2010	**EN 61000-6-2:2005**
	EN 61000-6-1:2007	**EN 61000-6-4:2007 + A1:2011**
	EN 61000-6-3:2007 + A1:2011	**IEC 60664-1:2020**
	EN 61800-3:2004+A1:2012	**EN 61326-1:2013**
	EN 61326-3-1:2017	**EN 61000-6-7:2015**

The conformity of the VersiSafe Speed device series with the standards and directives listed above has been determined:
Notified body: TÜV Rheinland Industrie Service GmbH, Am Grauen Stein 1, 51105 Köln
Notified body number: NB0035
Certificate number: 01/205/5602.01/23 date of issue: 02/27/2023

This EC Declaration of Conformity is no longer valid, if the product is modified or changed without our agreement.
This declaration is issued under the sole responsibility of the signatory.

Berg, 29.01.2026 (place, date)
Bernhard Tischner, Managing director (signatory and function of the signatory)
(signature)

6. Functions

The The auxiliary voltage is connected to terminals A1-A2. he equipment can be configured via the display and the setting keys on the front plate. Terminals E1a, E1b, E2L, E2H, E3L and E3H form the measuring input. For low voltages the measuring voltage is connected to E1a-E2L and E1b-E3L and for higher voltages to E1a-E2H and E1b-E3H (see section technical data).

When monitoring single phase AC voltage, it is recommended to connect the terminals E1a-E2L or E1a-E2H directly to the inverter, the terminals E1b-E3L or E1b-E3H directly to the motor connection terminals. Seperate wires in separate cables with space to each other have to be used for each of the frequency inputs. When monitoring 3-pase AC voltages it is recommended to wire these terminals directly to the motor connection terminals.

The input frequency and direction of rotation is compared to the setting value. As the device measures the cycle duration the fastest frequency measurement is possible.

Should the over-frequency function be set, then the output relay will switch to the alarm mode, when the set response parameter is overexceeded longer than the parametered alarm-delay function (tV). Should the frequency fall again below the response parameter, minus the set hysteresis, the output relay will be activated after the expiry of the resetdelay time period (tF) (depending on the evaluation of the direction of rotation) and return to its pre-set permitted supervisory state.

As regards the under-frequency function, the output relay will switch to the alarm mode, when the set response parameter is under-exceeded longer than the parametered alarm-delay function (tV) time period. As soon as the frequency return to the range governed by the response parameter, plus the set hysteresis, then the output relay will again return to the preset permitted state after the expiry of the reset-delay time period (tF) (depending on the evaluation of the direction of rotation).

In the „internal window function mode“, the output relay will switch to the alarm setting when the frequency exceed the pre-set permitted range of the response parameter. Once the frequency again return within the range of both the upper- and lower response parameters, minus and/or plus the pre-set hysteresis values (upper response parameter minus- and/or the lower response parameter plus -the relative hysteresis values), then the output relay will again switch back to the pre-set permitted range after the expiry of the reset-delay time period (tF) (depending on the evaluation of the direction of rotation).

In the „external window function mode“, the monitoring function acts inversely to the „internal window function“.

If the detection of the rotary direction is activated, the output relays switch to alarm position when the rotary direction detected deviates from the set rotary direction (Direction of rotation=wrong). If the rotary direction changes after that (Direction of rotation=correct), the output relays switch back to the good position (depending on the frequency evaluation). The rotary direction is only monitored from the adjustable minimum frequency onwards. Below this set minimum frequency, the rotary direction is considered as correct.

If the frequency monitoring and the monitoring of the rotary direction are activated, then the output relays only switch or remain in the good position if the good state is fulfilled for both monitoring functions.

If the frequency monitoring and the monitoring of the rotary direction are deactivated, the output relays are in alarm position.

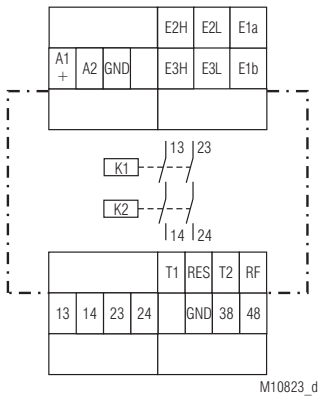
Should the manual reset function be activated, then the output relay continues to remain in good range or the direction of rotation in the

good state in the alarm setting when the frequency return to the pre-set permitted range. A resetting of the saved parameter is possible when the reset input is activated or the auxiliary voltage is shutdown. When a startup delay time period (tA) is set, then the set start-up delay time period will initially expire as soon as the auxiliary voltage of the equipment is switched-on and the 'RF' feedback circuit is closed. The start-up delay time period will also expire after a reset of the manual reset mode. During this time period, a frequency evaluation is disabled and the output relays remain (depending on the evaluation of the direction of rotation) at the preset permitted setting. The start-up delay function can, for example override an alarm message during the start-up stage of a generator or electric motor. Should, after a reset (in the manual reset mode), the feedback circuit not be closed, then the equipment will go into a safe error state.

If a start-up tolerance (nA) is set, first the counter for the start-up tolerance runs once the auxiliary voltage of the device has been switched on and the feedback circuit RF has been closed. Likewise, the start-up tolerance runs upon a reset in the operating mode alarm memory. During this time, there is no evaluation of the rotary motion, and the output relays remain in good position (depending on the frequency evaluation). By means of the start-up tolerance it is possible to suppress an alarm message during the start-up phase. If the feedback circuit is not closed upon a reset (in operating mode alarm memory), the device changes to a safe error state.

With correct connection it is possible to realise with the VersiSafe Speed the safety functions STO (Safe Torque Off), SOS (Safe Operating Stop), SLS (Safely Limited Speed), SSM (Safe Speed Monitor), SSR (Safe Speed Range) as well as SDI (safe direction of motion) according to EN 61800-5-2. The actual realisation of the safety functions has to be validated in each application of the product for safety aspects.

Circuit Diagrams



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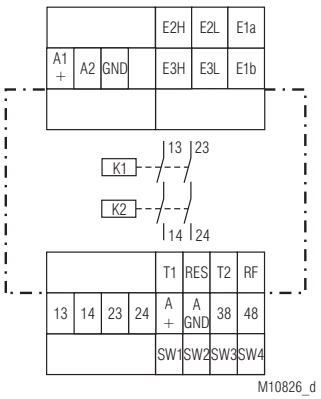

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Connection Terminals

Terminal designation	Signal designation
A1+	DC24V
A2	0V
E1a, E1b, E2L, E2H, E3L, E3H	Frequency measuring inputs
GND	Reference potential for semiconductor monitoring output and control outputs
13, 14, 23, 24	Forcibly guided NO contacts for release circuit
38, 48	Semiconductor-monitoring output
T1, T2	Control output
RES, RF, SW1, SW2, SW3, SW4	Control input
A+, A GND	Analogue output

Indicators

LED ON:	green	On, when supply connected
	green-flashing	Parameterization mode
	red-flashing	Parameterization error
LED K1/K2:	green	Relay K1 and K2 energized
	yellow	Muting (Relay K1 and K2 energized)
LED ERR:	red	Internal failure
	red-flashing	External failure
LED t:	green-flashing	(K1/K2; light up) Delay times runoff t_A or t_U
	yellow-flashing	(K1/K2 does not light up) Delay times runoff t_F
	yellow-flashing	(K1/K2 light up) Delay times runoff t_V
DISPLAY:		Status indication Alarms / diagnostics Parameterization

7. general description

7.1 Applications

Safe frequency monitoring of AC voltages

- Safe monitoring of the outputfrequency of inverters
- Safe monitoring of the rotorfrequency of slipring motors
- Safe control / monitoring of motorts in crane applications
- Safe monitoring of the direction of rotation with 3-phase AC voltages

With correct connection it is possible to realise with the UH 6937 the sa-fety functions STO (Safe Torque Off), SOS (Safe Operating Stop), SLS (Safely Limited Speed), SSM (Safe Speed Monitor) and SSR (Safe Speed Range) according to EN 61800-5-2. The actual realisation of the safety functions has to be validated in each application of the product for safety aspects.

7.2 Features

- **According to**
  For frequency monitoring:
  - PL e and category 4 according to EN ISO 13849-1
  - SIL 3 according to EN 61508
  For monitoring the phase sequence or direction of rotation:
  - PL d and Category 2 according to EN ISO 13849-1
  - SIL 2 according to EN 61508
- **Can be used in frequency monitoring security applications as follows:**
  - Up to maximum SIL 3 according to EN IEC 62061
  - Up to SIL 3 according to EN 61511
- **Can be used in safety applications of phase sequence or direction of rotation monitoring as follows:**
  - Up to maximum SIL 2 according to EN IEC 62061
  - Up to SIL 2 according to EN 61511
- Overfrequency, underfrequency or window monitoring of 1-phase or 3-phase AC voltages
- Monitoring of the direction of rotation with 3-phase AC voltages
- User-friendly front panel display
  - For convenient, menu-guided parameterization
  - For setpoint and actual value display of the frequency and direction of rotation
- Fast response time due to period measurement of the input frequency
- Universal measuring inputs for AC voltages from 8 ... 280 V for 1-phase monitoring and 16 ... 690 V for 1 and 3 phase monitoring
- Suitable for frequency converters
  - 1 … 700 Hz
- Adjustable hysteresis
- Adjustable release delay from 0 ... 100 s for the frequency monitoring
- Adjustable start-up bypass time of 0 ... 100 s for frequency monitoring or tolerance when switching on from 0 ... 60000 periods for direction of rotation monitoring
- Adjustable alarm delay of 0 ... 100 s for frequency monitoring or tolerance of 5 ... 60000 periods for direction of rotation monitoring
- Alarm latch or auto reset
- Galvanic isolation between measuring input, auxiliary voltage and output contacts
- 2-channel structure
- Forced output contacts
- LED displays and 2 semiconductor message outputs
- 45 mm overall width

- • With plug-in connection blocks for quick device replacement
  - Setting different response values by digital 4-bit selection possible from a higher-level controller
  - Analog output (2 ... 10 V) according to the current frequency
  - Possibility of bridging the frequency and direction of rotation monitoring (muting)
  - Adjustable switching time from 0 ... 100 s for frequency monitoring or tolerance when switching from 0 ... 60000 periods for monitoring the direction of rotation

8. Notes

8.1 Frequency measuring input

The measuring input is divided up in to voltage ranges (AC 8 ... 280 V on E1a-E2L und E1b-E3L and AC 16...690 V on E1a-E2H and E1b-E3H). If the measuring voltage is always higher then AC 16 V, the higher range should be used. A special dimensioned measuring input with low pass characteristic avoids the measuring of the pulse frequency. In addition the input sensitivity is adapted to the voltage-/frequency-characteristic of inverters.
Plesae make sure that the frequency measurement inputs must be connected to the same single-phase or three-phase network and that a three-phase network is required to monitor the direction of rotation.

8.2 Manual reset, automatic reset

In alarm storage mode, the reset input is provided for resetting the alarm status after overfrequency, underfrequency or after a direction error. If T1 is present at the input for longer than 1 second, a reset is carried out in the device. A new reset is only possible after the signal at the reset input has been briefly interrupted. This input is not taken into account in auto-reset mode because the reset is automatic.

8.3 Semiconductor outputs

The Semiconductor Output: 38 will indicate the status of the Relays: K1 / K2. When the relays are energized, then the Semiconductor Output: 38 is switched on. The Semiconductor Output: 48 will report errors within the equipment. Should an error actually exist, then the Semiconductor Output: 48 will be switched on.
The semiconductor outputs are not safety related. They can be used for monitoring purposes.

8.4 Setting the frequency thresholds

For the monitoring functions: „internal window monitoring function“ and in the „external window monitoring function“, a minimum difference between the lower- and the upper -threshold of 5% is to be anticipated at the upper frequency threshold, in addition to the already set hysteresis parameter. This is internally verified during the setting of the speed threshold and an error message will be displayed in case of any erroneous setting and/or the setting will not be permitted by the display. The maximum settable lower frequency threshold can be calculated as follows:

Monitoring function: „Internal window monitoring“:
Maximum lower threshold =
upper frequency threshold - (5% + 2 x hysteresis) x upper frequency threshold Example:
Upper frequency threshold 100 Hz, hysteresis 2 %
Maximum lower frequency threshold =
100 Hz - (0.05 + 2 x 0.02) x 100 Hz = 91 Hz

Monitoring function: „External window monitoring“ :
Maximum frequency threshold =
upper frequency threshold - 5 % x upper frequency threshold Example:
Upper frequency threshold 100 Hz, any required hysteresis
maximum lower frequency threshold =
100 Hz - 0.05 x 100 Hz = 95 Hz

8.5 Feedbak circuit

The feedback contacts of external contactors are monitored on terminal RF. The terminal RF gets the test signal from T2 via normally open contacts of the contactors which are connected to terminals 14 and 24. The normally closed contact have to be closed to start the device. If no contact extension or reinforcement is used, the terminals RF and T2 have to br bridged.

8.6 Start up time delay t_A

The start-up bypass time expires after switching on the auxiliary voltage of the device as soon as the feedback circuit RF is closed. In addition, the start-up delay expires after a reset in alarm storage mode. During this time, there is no frequency evaluation, the LED "t" flashes and the output contacts 13-14 and 23-24 remain closed (depending on the direction of rotation evaluation). Due to the start-up delay z. B. an alarm message during the start-up phase of a generator or motor can be suppressed. If the feedback circuit is not closed after a reset (during alarm storage operation), the device goes into a safe error state.

8.7 Alarm delay t_V

The alarm-delay time period will expire when the equipment has recognised, that the frequency exceed the permitted range. Only after the expiry of the alarm-delay time period, will the output contacts :13 to 14 and 23 to 24 be switched off. When the frequency again enter the permitted range during the alarm-delay time period, then the alarm-delay function is terminated. The LED „t“ will flash during the time period.

8.8 Reset delay time t_F

The release delay time is the time that elapses before the output contacts 13-14 and 23-24 are switched through (depending on the evaluation of the direction of rotation) after a good status has been recognized (frequency within the desired range). If the frequency goes back into alarm (frequency outside the desired range) while the release delay time is elapsing, the release delay is stopped. The LED “t” flashes while the time is running. The start-up bypass time has priority over the enable delay time, i.e. if the output contacts are switched through by the start-up bypass, the enable delay time is ignored (output contacts 13-14 and 23-24 closed). The release delay time is also no longer started immediately after the start-up bypass time has expired.

8.9 Start-up tolerance n_A

The start-up tolerance expires after switching on the auxiliary voltage of the device as soon as the feedback circuit RF is closed. In addition, the start-up tolerance expires after a reset in alarm storage mode. During this time there is no evaluation of the direction of rotation, the LED "t" flashes and the output contacts 13-14 and 23-24 remain closed (depending on the frequency evaluation). Due to the start-up tolerance, e.g. B. an alarm message during the start-up phase of a generator or motor can be suppressed. If the feedback circuit is not closed after a reset (during alarm storage operation), the device goes into a safe error state.

8.10 Alarm tolerance n_V

The alarm tolerance expires after the device has recognized that the direction of rotation does not correspond to the set specification. The output contacts 13-14 and 23-24 are only switched off after the alarm tolerance has expired. If the frequency returns to good while the alarm tolerance is elapsing, the alarm tolerance elapses. The LED "t" flashes during the process.

8.11 Minimum frequency

The direction of rotation is only monitored above the set minimum frequency. If the frequency at one of the two frequency measurement inputs is below this set minimum frequency, the direction of rotation is considered correct.

8.12 discrepancy time

Different frequencies are tolerated at the two measurement inputs within the discrepancy time. If the discrepancy between the frequencies at the measurement inputs lasts longer than the set discrepancy time, the device goes into a safe error state.

8.13 Display

In normal operating mode, all settings can be checked at any time by pressing the UP or DOWN keys.
Additionally, the frequency is displayed. However, this frequency does not correspond to the device´s accuracy and is only designed for diagnostic purposes.
In the case of wiring errors and system failures corresponding diagnostic messages are displayed on the display.

8.14 Parameterization using the display

1.	**parameterization**				
	1.1	**limits and direction of rotation**			
		frequency mode 1			
		monitoring function 1	overfrequency	x	
			underfrequency	-	
			window (inside)	-	
			window (outside)	-	
			f-monitoring off	-	
		f-limits 1			
		Upper limit 1	400,0	Hz	2)
		Lower limit 1	200,0	Hz	3)
		direction of rotation 1	clockwise rotation	-	
			reverse rotation	-	
			Direction of rotation off	x	
		frequency mode 2			
		monitoring function 2	overfrequency	x	
			underfrequency	-	
			window (inside)	-	
			window (outside)	-	
			f-monitoring off	-	
		f-limits 2			
		Upper limit 2	400,0	Hz	2)
		Lower limit 2	200,0	Hz	3)
		direction of rotation 2	clockwise rotation	-	
			reverse rotation	-	
			Direction of rotation off	x	
		frequency mode 3			
		monitoring function 3	overfrequency	x	
			underfrequency	-	
			window (inside)	-	
			window (outside)	-	
			f-monitoring off	-	1)
		f-limits 3			
		Upper limit 3	400,0	Hz	2)
		Lower limit 3	200,0	Hz	3)
		direction of rotation 3	clockwise rotation	-	
			reverse rotation	-	
			Direction of rotation off	x	
		frequency mode 4			
		monitoring function 4	overfrequency	x	
			underfrequency	-	
			window (inside)	-	
			window (outside)	-	
			f-monitoring off	-	
		f-limits 4			
		Upper limit 4	400,0	Hz	2)
		Lower limit 4	200,0	Hz	3)
		direction of rotation 4	clockwise rotation	-	
			reverse rotation	-	
			Direction of rotation off	x	
		Esc		OK	

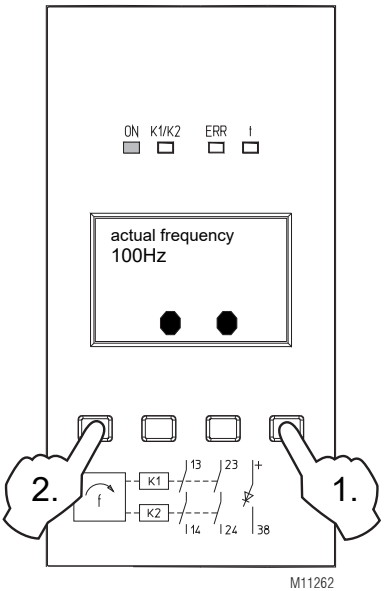
	1.2	**hysteresis**			
		5	%		
		Esc			OK
	1.3	**times**			
		start-up bridging			
		0,0	s		
		release delay			
		0,0	s		
		alarm delay			
		0,1	s		
		switch override			1)
		0,0	s		
		Esc			OK
	1.4	**tolerance of direction of rotation**			
		start-up tolerance			
		0	period(s)		
		alarm tolerance			
		10	period(s)		
		toggle Tolerance			1)
		0	period(s)		
		Esc			OK
	1.5	**alarm storage**			
		alarm storage	x		
		automatic reset	-		
		Esc			OK
	1.6	**mutingfunction**			
		activate	-		1)
		deactivate	x		
		Esc			OK
	Esc				OK
	1.7	**advanced settings**			
		Minimum frequency for Direction of rotation monitoring	5 Hz		
		discrepancy time	30,0 s		
		Esc			OK
	Esc				OK
2.		**display settings**			
	2.1	**languages**			
		English	x		
		Deutsch	-		
		Français	-		
		Esc			OK
	2.2	**contrast**			
		50	%		
		Esc			OK

	2.3	**lighting**		
			off	-
			10 s	x
			1 min	-
			5 min	-
		Esc		OK
	2.4	**operation display**		
			Manuell	x
			10 s	-
			1 min	-
			5 min	-
		Esc		OK
	Esc			OK
3.	**default settings**			
		parameter		
		display settings		
		parameter + display settings		
	Esc			OK
4.	**changes**			
	4.1	**lock**		
		activate		
	4.2	**pursue**		
		activate		
	Esc			OK
Esc				OK

1) Only available in variant /_ _1.
2) Not available with the "underfrequency" monitoring function.
3) Customized variants have different factory settings.
4) Customized variants have different factory settings.
These are available upon request.

To enter the device´s parameterization mode the following key combination is provided:

Press and keep pressed the right key at first. Then, press the left key (see below). A display test follows and has to be acknowledged using the OK key (right key) when it was successful. Then, it is possible to change the parameterization. Before the device adopts changed parameters, they must be confirmed once more for safety reasons.



8.15 Change tracking

To detect non permitted changes of the settings, the menue item change tracking is available. This setting allows to activate a counter once, which is then incremented with each confirmed change of the settings. After ac-tivation of this function the user cannot reset the counter or disable this function again.

8.16 Digital selection via the software Inputs: SW1 to SW4

Four different frequency modes with different response values can be configured via the digital inputs SW1 to SW4 (see table). The supply of the inputs must be between DC 10 V and DC 26.4 V to GND. Switching can also take place during operation. If the frequency mode is changed during operation, the changeover time (tU) for the frequency evaluation and the changeover tolerance (nU) for the direction of rotation evaluation expire, provided that the output relays are switched through during the changeover and the start-up delay (tA) has expired. During the changeover time or changeover tolerance, there is no frequency evaluation or direction of rotation evaluation and the output relays remain energized. If the frequency mode is changed again while the switching time or the switching tolerance is running, the switching time or the switching tolerance is not restarted. After the switchover time or the switchover tolerance has expired, monitoring is continued with the currently set frequency mode. Due to the switching time or the switching tolerance, e.g. B. an alarm message during the run-up phase or braking phase of a generator or motor can be suppressed..

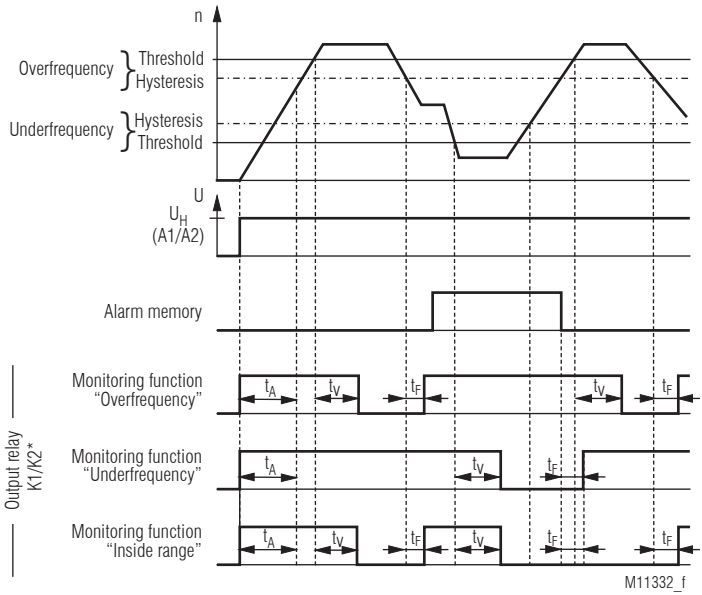
SW1	SW2	SW3	SW4	Modus
0	0	1	1	Frequency mode 1
0	1	1	0	Frequency mode 2
1	0	0	1	Frequency mode 3
1	1	0	0	Frequency mode 4

Caution

Any continuously repeated switching over of the frequency modus (always immediately after the expiry of the switcho-ver time period) can lead to the situation, that the equipment starts to function similarly as in the „Muting Mode“ (i.e. the frequency monitoring function is overridden and the output relays remain permanently on).

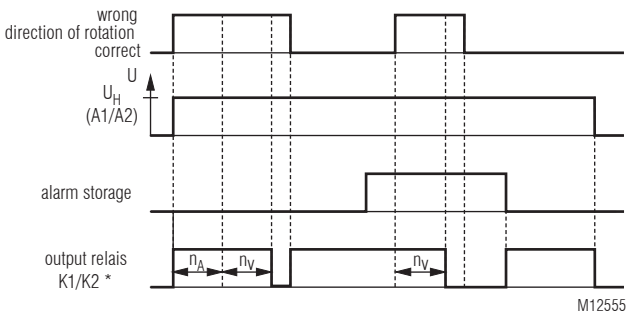
9. Device and function description

9.1 Function Diagram



t_A = Start-up delay, t_V = Alarm delay, t_F = Response delay

*Depending on the direction of rotation monitor



n_A = start-up tolerance n_V = alarm tolerance

* Depending on frequency monitoring

9.2 Muting function

The frequency monitoring or direction of rotation monitoring can be bridged using the display and appropriate control of the digital inputs SW1-SW4. To do this, the muting function must be activated during parameterization on the display. If this function is activated, it is still possible to switch between frequency modes 1-3 as described above. If frequency mode 4 (muting) is selected via the SW inputs, there is no longer any frequency monitoring or direction of rotation monitoring, the output relays are permanently connected and the start-up delay (tA), switching time (tU), release delay (tF), alarm delay (tV), start-up Tolerance (nA), switching tolerance (nU) and alarm tolerance (nV) are reset.

9.3 Analogue output A+ and A GND

The analog output with 2-10 V is used to output the currently measured frequency. The maximum value of the analog output (10 V) corresponds to the set upper limit (frequency threshold). The minimum value of the analog output (2 V) corresponds to the set lower limit. The scaling is frequency-linear.

In the "Underfrequency" monitoring function, the maximum value of the analog output corresponds to the maximum adjustable response value of the device.

In the "Overfrequency" monitoring function, the minimum value of the analog output corresponds to 0 Hz.

If the muting function is selected or if frequency monitoring and direction of rotation monitoring are deactivated, the maximum value of the analog output corresponds to the maximum adjustable response value of the device and the minimum value corresponds to 0 Hz

In the event of an error, 0 V is output at the analog output.

The analog output is not safety-related and can be used for diagnostic purposes.

9.4 Switchover time period t_U

The switching time expires when the frequency modes are changed during operation using the digital inputs SW1-SW4, the output contacts are closed, no start-up delay is running and tU has not already started or is about to expire. During this time, there is no frequency evaluation and the output contacts are switched (depending on the direction of rotation evaluation).

10. Technical Data

10.1 Frequency Measuring Input

Voltage range	
E1a-E2L, E1b-E3L:	AC 8 ... 280 V
E1a-E2H, E1b-E3H:	AC 16 ... 600 V
(dependent to frequency see characteristic)	
Input frequency:	< 700Hz
Galvanic separation:	Frequency measuring input to auxiliary voltage and output contacts
Response value	einstellbar von 1 Hz ... 600 Hz
Pulse frequency inverters	=>1 kHz

Measuring accuracy:

<700Hz	<± 2%
Stability of the setting threshold at variation of auxiliary voltage and temperature:	< ± 1%
Hysteresis:	adjustable from 2 ... 10 %of the set response value
Reaction time of frequency monitoring: :	Duration of 1 cycle (inverse value of adjusted frequency) + 10 ms + adjusted response delay
Reaction time of direction of rotation monitoring:	Duration of 1 cycle (inverse value of the applied frequency) + 10 ms + adjusted alarm tolerance
Alarm delay t_V:	adjustable from 0.1 ... 100 s
Start up time delay t_A:	adjustable from 0 ... 100 s
Reset delay t_F:	adjustable from 0 ... 100 s
Switchover time period t_U:	adjustable from 0 ... 100 s
Alarm-Tolerance n_V:	adjustable from 5 ... 60000 periods
Start-up-Tolerance n_A:	adjustable from 0 ... 60000 periods
Toggle-Tolerance n_U:	adjustable from 0 ... 60000 periods
Minimum frequency direction of rotation monitoring:	adjustable from 1 ... 100 Hz
Discrepancy time t_D:	adjustable from 1 ... 250 s
Accuracy of the adjustable times:	< ± 5%
Time between connection of auxiliary supply and ready to mesure:	approx. 1.5 s (with start up delay is 0)

10.2 Auxiliary circuit (A1-A2)

Auxiliary voltage U_H (galvanic separation to measuring input):	DC 24 V The power supply shall meet the requirements of SELV / PELV.
Voltage range:	0.8 ... 1.1 U_H
Nominal consumption:	typ. 3.2 W
Short-circuit protection:	Internal PTC
Overvoltage protection:	Internal VDR
Duty-cycle Reset button:	> 1,2 s

10.3 Output

Contacts:	2 NO contactsr
Contact type:	**Relay forcibly guide**
Thermischer Strom I_{th}:	8 A (see current limit curve)

Switching capacity		
to AC 15:	3A / AC 230V	IEC/EN 60 947-5-1
to DC 13:	2A / DC 24V	IEC/EN 60 947-5-1
to DC 13::	4 A / DC 24 V at 0.1 Hz	
Electrical life		
at 5 A, AC 230 V cos phi = 1:	> 2.2 x 10^5 switch. cycl.	IEC/EN 60 947-5-1
Short circuit strength		
max. fuse rating:	10 A gL	IEC/EN 60 947-5-1
Mechanical life:	20 x 10^6 switching cycles	
Semiconductor		
monitoring output:	DC 24 V, 50 mA, plus switching	
Analogue output:	2 ... 10 V, max. 10 mA	

10.4 General Data

Nominal operating mode:	continuous operation		
Temperature range			
operation:	- 20 ... + 60°C (see quadratic total current limit curve) At an altitude of > 2000 m the maximum permissible temperature reduces by 0.5 °C / 100 m		
storage:	- 20 ... + 70°C		
Altitude:			
Clearance and creepage distance			
rated impuls voltage / pollution degree:	IEC 60664-1		
	<=2000m	>2000m...<=4000m	
measuring input to the remainder:	6kV / 2	4kV / 2	
output to the remainder:	4kV / 2	2,5kV / 2	
EMC	EN 61800-3, IEC/EN 61326-3-1		
Interference suppression:	Limit value class B		EN 55 011
Degree of protection:			
Housing:	IP 40		IEC/EN 60 529
Terminals:	IP 20		IEC/EN 60 529
Housing:	Thermoplastic with V0 behaviour according to UL subject 94		
Vibration resistance	Amplitude 0.35 mm frequency 10 ... 55 Hz		IEC/EN 60 068-2-6
Climate resistance:	20 / 060 / 04		IEC/EN 60 068-1
Terminal designation:			EN 50 005
Insulation of wires or sleeve length:	7mm		
Wire fixing:	captive slotted screw		
Mounting:	DIN-rail		EC/EN 60 715
Weight:	approx. 320g		

10.5 Safety-related characteristics of the frequency monitoring:

EN ISO 13849-1:	**operating altitude <= 2000m**	**operating altitude > 2000m to <= 4000m**	
Category:	4	4	
PL:	e	e	
$MTTF_d$:	139,6	120,1	a (year)
DC_{avg}:	99,0	99,0	%
d_{op}:	365	365	d/a (days/year)
h_{op}:	24	24	h/d (hours/day)
t_{cycle}:	3600	3600	s/cycle
	= 1	= 1	/h (hour)

EN IEC 62061 EN 61508 EN 61511:			
maximum SIL:	3	3	IEC/EN 62061
SIL:	3	3	IEC/EN 61508
HFT*):	1	1	
DC:	99,0	99,0	%
PFH_D:	1,9E-10	2,2E-10	h^{-1}
PFH_{AVG}:	8,2E-05	8,5E-05	(Low Demand Mode)
T_1:	20	20	a (year)
*) HFT = Hardware failure tolerance			

10.6 Safety-related characteristics of the direction of rotation monitoring:

EN ISO 13849-1:	**operating altitude <= 2000m**	**operating altitude > 2000m to <= 4000m**	
Category:	2	2	
PL:	d	d	
$MTTF_d$:	128,6	111,8	a (year)
DC_{avg}:	98,9	98,9	%
d_{op}:	365	365	d/a (days/year)
h_{op}:	24	24	h/d (hours/day)
t_{cycle}:	3600	3600	s/cycle
	= 1	= 1	/h (hour)

EN IEC 62061 EN 61508 EN 61511:			
maximum SIL:	2	2	IEC/EN 62061
SIL:	2	2	IEC/EN 61508
HFT*):	0	0	
DC:	99,0	99,0	%
PFH_D:	3,1E-09	3,2E-09	h^{-1}
PFH_{AVG}:	3,4E-04	3,4E-04	(Low Demand Mode)
T_1:	20	20	a (year)
*) HFT = Hardware failure tolerance			

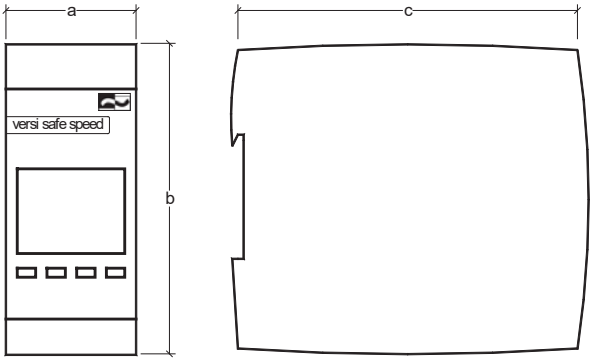
Demand to our device based on the evaluated neccessary safety level of the application.		IIntervall for cyclic test of the safety function
acc. to EN ISO 13849-1	PL e with Cat. 3 or Cat. 4	once per month
	PL d with Cat. 3	once per year
acc. to EN IEC 62061, EN IEC 61508	maximum SIL 3, SIL 3 with HFT = 1	once per month
	maximum SIL 2, SIL 2 with HFT = 1	once per year

Note

The values stated above are valid for the standard type.
Safety data for other variants are available on request.
The safety relevant data of the complete system has to be determined by the manufacturer of the system.

During longer periods of inactivity a test of the safety function is recommended.

10.7 Dimensions



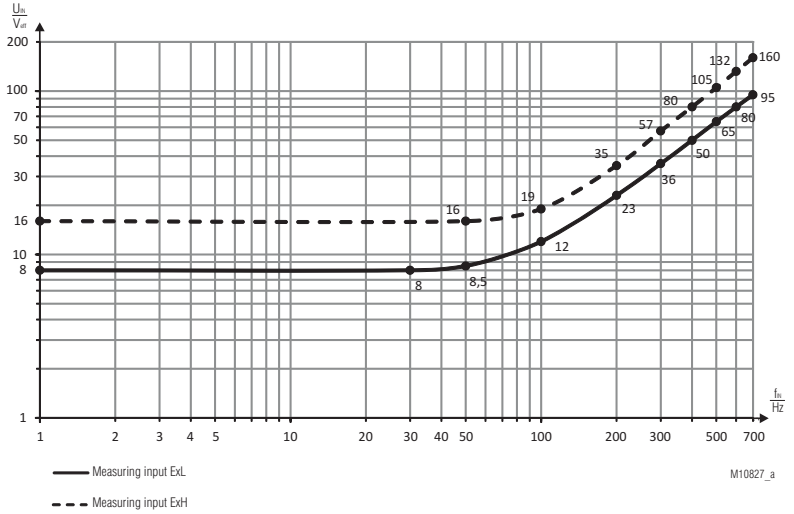
Dimensions	a	b	c
VersiSafe Speed	45mm	107mm	121mm

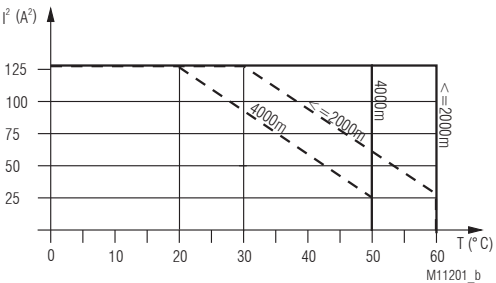
Standard Type

VersiSafe Speed
Article number: 27810.69000

- Output: 2 NO contacts
- Auxiliary voltage U_H: DC 24V

10.8 Characteristic





device free-standing
max. current at 60°C (<=2000m) or 50°C (4000m) over
2 contact path = 8A =^ $2x8^2A^2 = 128A^2$

device mounted without distance heated by
devices with same load,
max. current at 60°C (<=2000m) or 50°C (4000m) over
2 contact path = 4A =^ $2x4^2A^2 = 32A^2$

$$I^2 = I_1^2 + I_2^2$$

I_1, I_2 - current in contact paths

cumulative current limit curve
From an operating altitude > 2000 m,
the curve is adjusted accordingly by - 0.5 °C / 100 m (see example for 4000 m).

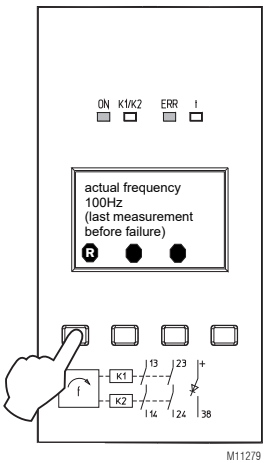
11. Failure monitoring

11.1 Troubleshooting

Failure	Potential cause
LED „ON“ does not light up	- Power supply A1+/A2 not connected
LED „ON“ flashes red	- Parameterization error (detailed description on display)
LED „ERR“ flashes red	- External failure (detailed description on display)
LED „ERR“ continuously on	- Device failure (if the failure still exists after restart, replace device)

11.2 Fault handling

When faults are detected on or in the device they are indicated on the display by an appropriate message. If a reset of the device is necessary due to the fault, at first the alarm and the associated diagnostic message have to be acknowledged. Then, the left key has to be pressed for approx. 3 sec. to initiate a reset of the device.



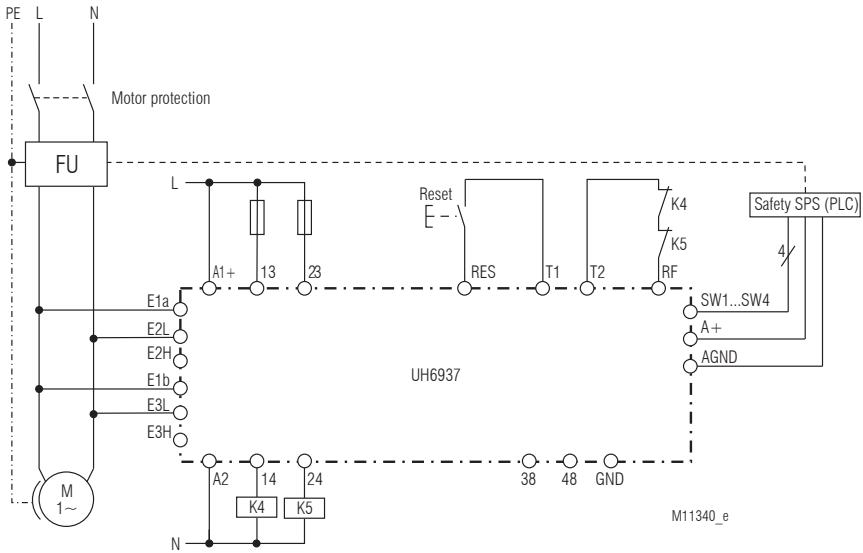
If a system failure is detected again after restart the device must be replaced and sent back to manufacturer.

11.3 Maintenance and repairs

- The device contains no parts that require maintenance.
- In case of failure, do not open the device but send it to manufacturer for repair.

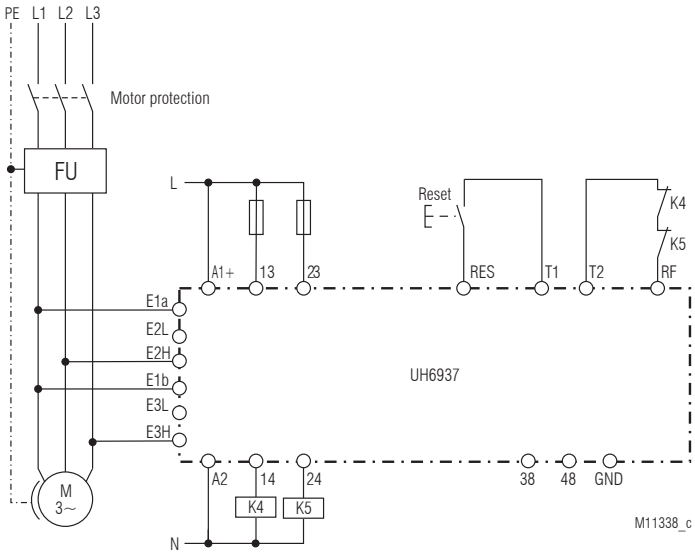
12. Connection diagramm

12.1 with single-phase motor



FU monitoring, 1-phase;
Frequency monitoring: Suitable up to SIL3, Performance Level e, Cat.4

12.2 with 3-phase motor



FU monitoring, 3-phase,

Frequency monitoring: Suitable up to SIL3, Performance Level e, Cat. 4

Direction of rotation monitoring: Suitable up to SIL2, Performance Level d, Cat. 2

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