English

Operating and Assembly Instructions

Electronic function module UO-EM-EGS41

Evaluation to U-ONE® - electronic overspeed switch

SIL 2 Functional Safety PL d

certificated according EN 61508 SIL2 and DIN EN ISO 13849-1 PL d

Translation of the original
operating and assembly instructions
ID 74481

October 2018

Read the Operating and Assembly Instructions prior to assembly, starting installation and handling!
Keep for future reference!

Trademark

Manufacturer / publisher

Johannes Hubner
Fabrik elektrischer Maschinen GmbH
Siemensstraße 7
35394 Giessen
Germany

Phone:	+49 641 / 7969-0
Fax:	+49 641 / 73645
E-Mail:	info@huebner-giessen.com
	www.huebner-giessen.com
Headquarters:	Giessen
Court of registration:	Giessen
Commercial register number:	HRB 126

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Directory

1 General

1.1 Information about the operating and assembly instructions

These operating and assembly instructions provide important instructions for working with the device. They must be carefully read prior to starting all tasks, and the instructions contained herein must be followed.

In addition, applicable local regulations for the prevention of industrial accidents and general safety regulations must be complied with.

For other, non SIL certified electronic function modules please refer to the separate Operating and Installation Instructions.

1.2 Scope of supply

The scope of supply of the electronic function module overspeed switch UO-EM-EGS41 includes the Operating and Installation Instructions (with SIL safety instructions), the programming software EGS41Pro (on CD) and the programming cable.
The Operating and Installation Instructions for the electronic function module is also included on the supplied CD.

1.3 Explanation of symbols

Warnings are indicated by symbols in these operating and assembly instructions. The warnings are introduced by signal words that express the scope of the hazard.
The warnings must be strictly heeded; you must act prudently to prevent accidents, personal injury, and property damage.

WARNING!
Indicates a possibly dangerous situation that can result in death or serious injury if it is not avoided.

CAUTION!
Indicates a possibly dangerous situation that can result in minor injury if it is not avoided.

CAUTION!
Indicates a possibly dangerous situation that can result in material damage if it is not avoided.

NOTES!
Indicates useful tips and recommendations as well as information for efficient and trouble-free operation.

NOTES!
Do not use a hammer or similar tool when installing the device due to the risk of damage occurring to the bearings or coupling!

DANGER!
Life-threatening danger due to electric shock!
Indicates a life-threatening situation due to electric shock. If the safety instructions are not complied with there is danger of serious injury or death. The work that must be executed should only be performed by a qualified electrician.

1.4 Disclaimer

All information and instructions in these operating and assembly instructions have been provided under due consideration of applicable guidelines, as well as our many years of experience.
The manufacturer assumes no liability for damages due to:

- Failure to follow the instructions in the operating and assembly instructions
- Non-intended use
- Deployment of untrained personnel
- Opening of the device or conversions of the device

In all other aspects the obligations agreed in the delivery contract as well as the delivery conditions of the manufacturer apply.

1.5 Copyright

NOTE!
Content information, text, drawings, graphics, and other representations are protected by copyright and are subject to commercial property rights.
It is strictly forbidden to make copies of any kind or by any means for any purpose other than in conjunction with using the device without the prior written agreement of the manufacturer. Any copyright infringements will be prosecuted.

1.6 Guarantee terms

The guarantee terms are provided in the manufacturer´s terms and conditions.

1.7 Customer service

For technical information personnel is available that can be reached per telephone, fax or email. See manufacturer´s address on page 2.

2 Safety

DANGER!
This section provides an overview of all the important safety aspects that ensure protection of personnel, as well as safe and trouble-free device operation.
If these safety instructions are not complied with significant hazard can occur.

2.1 Responsibility of the owner

The device is used in commercial applications. Consequently the owner of the device is subject to the legal occupational safety obligations, and subject to the safety, accident prevention, and environmental protection regulations that are applicable for the devices area of implementation.

2.2 Personnel

Qualified personnel only are permitted to install, mount, program, commission, operate, maintain and take out of service the devices.

Qualified personnel are people who have received

- training to qualify as an electrician or
- instructions from qualified trades personnel

entitling them to work with and on devices, systems, machinery and plant in accordance with generally accepted standards and safety engineering guidelines.

In addition, the owner is obliged to deploy only personnel who

- are familiar with the fundamental regulations covering work safety and accident prevention,
- have read and understood the chapter "Safety" in these Operating and Installation Instructions,
- and are familiar with the basic and specialist standards that apply to the specific application.

2.3 Special dangers

Residual risks that have been determined based on a risk analysis are cited below.

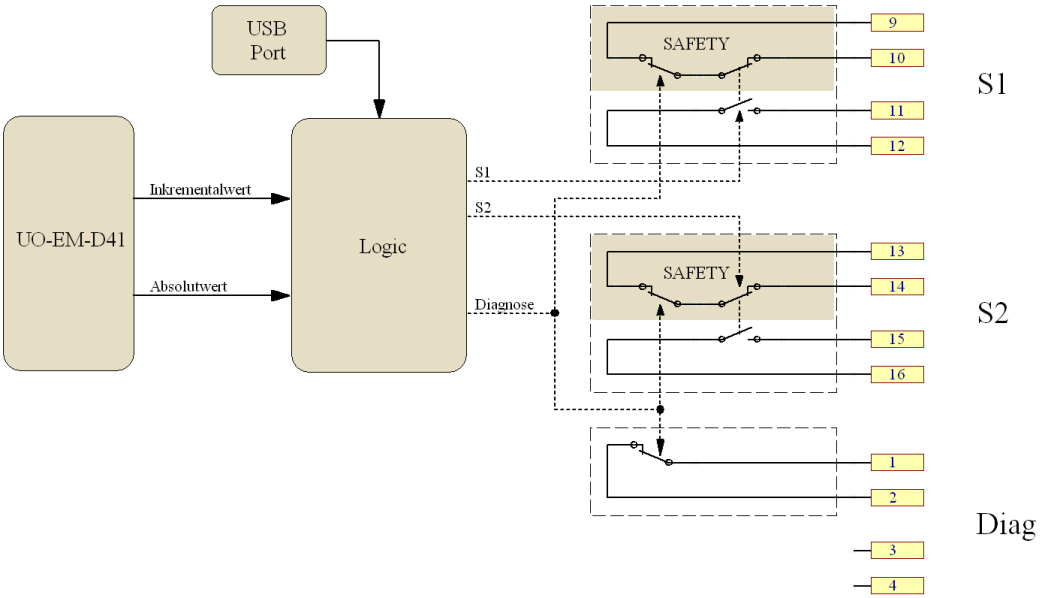
DANGER!
Life-threatening danger due to electrical shock!
There is an imminent life-threatening hazard if live parts are touched. Damage to insulation or to specific components can pose a life-threatening hazard.
Therefore:
Immediately switch off the device and have it repaired if there is damage to the insulation of the power supply.
De-energize the electrical equipment and ensure that all components are connected for all tasks on the electrical equipment.
Keep moisture away from live parts. Moisture can cause short circuits.

DANGER!
Life-threatening danger if restarted without authorization!
When correcting faults there is danger of the power supply being switched on without authorization.
This poses a life-threatening hazard for persons in the danger zone.
Therefore:
Prior to starting work, switch off the system and safeguard it from being switched on again.

3 Technical Data

3.1 Construction and function

Block diagram:



3.2 Short description

The U-ONE universal encoder system including the basic device UOM(H) 41L-1212 and the electronic function modules UO-EM-D41 and UO-EM-EGS41 is an overspeed switch (certified to EN 61508 SIL2 and EN 13849-1 PLd).
The function module is configured using a PC running a Windows® operating system (XP, Vista and 7) in conjunction with the programming software EGS41Pro included in the scope of supply. The physical interface is USB.

The overspeed switches S1 and S2 are switched according to the set speed parameters.
The switches S1 terminal 9/10 and S2 terminal 13/14 are envisaged for safety-relevant switching. A separate diagnostic switch is connected in series. An auxiliary contact is also available for each respective switch S1 (terminal 11/12) and S2 (terminal 15/16).

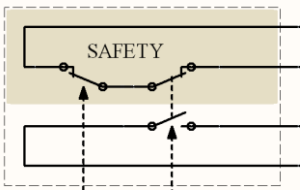
The outputs of the switches are electrically isolated from the electronics and the PC interface.

3.3 Overspeed switch-off

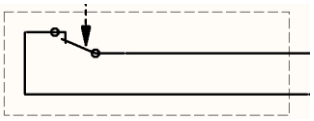
The incremental signal is utilized to determine the speed. The switch opens reliably if the speed exceeds the user-defined switching point

The device is equipped with a safety relay with positively driven contacts for each switching output. That facilitates 2-channel evaluation of the switching status with line monitoring by a downstream control.

The module incorporates 2 identical switching channels (S1 and S2). Green LEDs indicate the switching status of the safety switches (lit LED = switch closed).



A separate diagnostics switch (Diag) closes when no errors are diagnosed. This is also indicated on the front of the module by a green LED. If an error is established the switch opens and a red LED lights up.



3.4 Reset input

The reset input is electrically isolated and triggers a module restart (hardware reset) when a DC voltage (12...30 VDC) is applied. The module performs an complete self-test. An established error is reset.

3.5 Other functions

The following additional, non safety-relevant functions are available:

- Adjustable release point:
  The user is able to select the release point (hysteresis) as required across the entire operating range.
  Restriction: the difference between the speed of the release point and the switching point must be at least 10%.

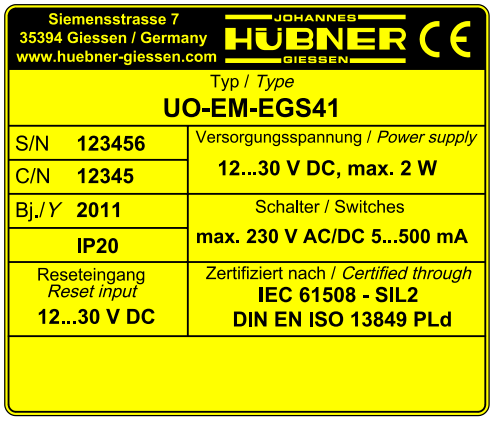
- Underspeed
  To facilitate underspeed switch-off it is possible to activate a further switching point (underspeed switch-off). The switch opens if the speed falls below the set switching point (see configuration Guide).

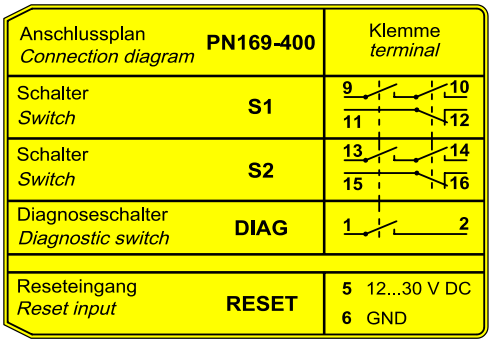
- Slip detection
  The slip detection function closes a switch if the set slip angle is exceeded
  (see configuration Guide).

- Rotation direction dependent switching
  It is possible to select a variety of switching speeds, depending on the direction of rotation. This function can be combined with all other functions (see configuration Guide).

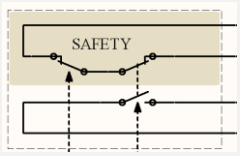
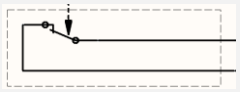
- Switch delay
  Briefly overshooting the switching speed (1 ms...300 ms) will not trigger overspeed switch-off (see configuration Guide).

3.6 Type plate /connection diagram





3.7 Connected loads environment

Description	Worth
Supply voltage	Supply via bus connections (12 … 30 V DC)
Power consumption	max. 2 W
Connection	COMBICON®-terminal strips
Switching outputs S1/2	 Relays with forcibly guided contacts max. 230V AC/DC 5 … 500mA
Switching output Diag	 Relay contact max. 230V AC/DC 5 … 500mA
Switching power (max. switching cycles: approx. 2 x 10^6)	5 … 230V AC 5 … 500 mA 5 … 30V DC 5 … 500 mA 230V DC 5 … 150 mA
Reset input	potential free, reset voltage 12 … 30 V DC / ca. 7 mA
Programmable switching speeds	0,5 … 2700 rpm
Switching differential (see. chapter. 4.3)	Measuring angle approx.1° Accuracy: 2% Switching time T_{Sw}: < 20 ms
Programming interface	USB
Connecting diagram	PN169-400
Device temperature range	-25 … + 70 °C
Degree of protection	IP20

Install a back-up fuse (2A) to protect the relay contacts against overcurrents.

3.8 Connectors and Indicators

Indicators		
S1, S2, Diag	LEDs light up when switches are closed	
State	**Green LED**	
	Lit:	Operational
	Flashes 1x	Absolute signal not detected (FOC 2)
	Flashes 2x	Speed signal not detected (FOC 1)
	Red LED lit:	Error condition
Reset	**Red LED lit:**	Reset condition

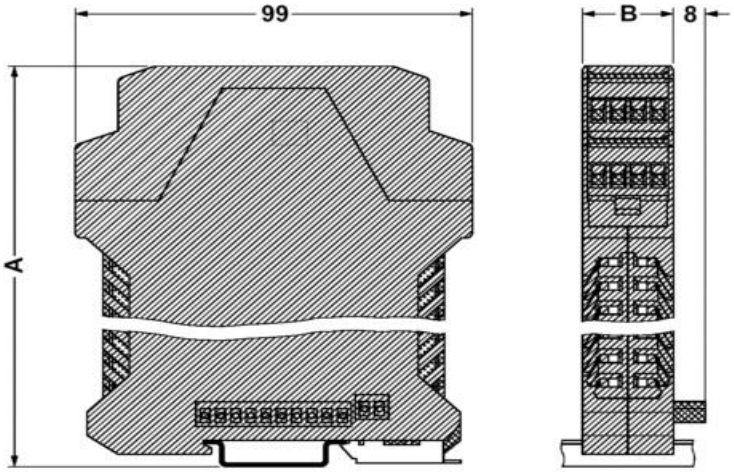
3.9 Mounting the module

Snap the modules onto the top-hat rail and slide together.

ATTENTION!
Ensure you do not damage the connectors when you snap the modules onto the rail and push them together!

Ensure the modules contact reliably when joining them together on the top-hat mounting rail.
Fit the supplied shrouding covers to both ends of the mounted terminals.
Follow the connection diagram!

3.10 Dimension drawing



A = 114,50 mm
B = 45 mm

4 Functional safety

4.1 Characteristic safety values

The details below refer to the overall system consisting of:
Electronic function module UO-EM-EGS41 (overspeed switch)

Characteristic safety values	
Safety class / standard	• SIL2 to EN 61508 • Performance level 'd' to EN ISO 13849-1 • Category 2
System structure	1 channel with diagnostics (1oo1D)
Device type	Type B (complex components)
Hardware fault tolerance (HFT)	0
Type of operating mode	'High demand' to EN 61508 (high demand rate)
Probability of a dangerous failure per hour (PFH_d)	1,44 x 10^{-7} [1/h]
Failure rate: safe detected (λ_{SD}) safe undetected (λ_{SU}) Dangerous detected (λ_{DD}) Dangerous undetected (λ_{DU})	 λ_{SD}: 8,40 x 10^{-7} [1/h] λ_{SU}: 2,22 x 10^{-7} [1/h] λ_{DD}: 1,13 x 10^{-6} [1/h] λ_{DU}: 1,44 x 10^{-7} [1/h]
Mean time to a dangerous failure ($MTTF_d$)	89.9 years (high)
Diagnostic coverage on average (DC_{AVG})	medium
Proportion of safe failure fraction (SFF)	93,8%
Service life or proof test interval to EN 61508	10 years Thereafter the components must be replaced with new components
Safe state	• Switch S1 (terminals 9 / 10) open • Switch S2 (terminals 13 / 14) open • Diagnostic switch open.
Safety function	Safe overspeed switch-off switch S1 (terminals 9 / 10) and switch S2 (terminals 13 / 14).

4.2 Timing

Chapter 7.4.3.2.5 of
EN 61508-2 should also be taken into consideration with regard to the process safety time of the application.

- **Power-on time T_{Pw}**

After the power supply is turned on initial internal diagnostic checks are carried out before the device is ready for operations.
The power-on time is approx. 1.6 s.

- **Diagnostic time T_{Diag}**

The diagnostic time is 200 ms. If a diagnosis is flawed the diagnostics are carried out again (repeat measurement). The max. repeat measurement time is 500 ms. If the repeat measurement is also flawed the device is put into a 'safe state'.

- **Switching time T_s**

The switching time T_S of the switching contacts S1 and S2 is composed of:

T_S = **T_{meas}** (speed measurement time) + **T_{Sys}** (system time) + **T_D** (adjustable switch delay see Chapter 4.3)

In addition, the optionally adjustable switch delay (delay = 0 ... 300 ms) must be added.

4.3 Switching deviation

Switching deviation consists of:

- Measuring accuracy (errors when determining the speed):
  N_{error} = 2%
- Speed measurement time (time required to identify the speed)

$$T_{mess} = \frac{1000}{6 * n_0} ms$$

- System time T_{Sys} (calculation time + switching time of re
  T_{Sys} = max. 20 ms
- Adjustable switch delay
  T_D = 0 ... 300 ms

Max. switching deviation:

$$\Delta n = \left[n_0 \times n_{Fehler} + \alpha \times \frac{(T_{mess} + T_S + T_D)}{1000} \right] 1/\min$$

n_0:	Programmed switching speed [rpm]
α :	Acceleration $\left[\frac{1/\min}{s}\right]$
T_D:	Adjustable switch delay [s]
T_{Sys}:	System time [s]
n_{error}:	0.02 (2%)

4.4 Proper use

The universal encoder system from the series UOM 41L-1212 which includes the electronic function modules
UO-EM-D41 and UO-EM-EGS41 has been designed and built solely for the intended purpose described in these Operating and Installation Instructions.

It is designed to detect overspeeds (programmable), for example in electric and mechanical drives, lifting equipment and winding plant.

The electronic function module UO-EM-EGS41 is a safety switching device that generates a switching signal (opens the switching contact) for the higher-level controls. This is responsible for necessary actions, such as shutting down plant components.

We do not accept liability of any kind for damages arising from improper use of the device. The owner bears sole responsibility for any improper use.

4.5 Improper use

- Do not use the device in potentially explosive areas.
- It is not permitted to use the device in locations higher than 3000 m above sea level.

4.6 Notes on configuration

It is only possible to configure the device with password authorization (user rights: administrator). The factory-set administrator password is: huebner. For reasons of safety it is strongly advised that you create a user-defined password (max. 12 characters). Information on how to change the password is available on Parameters 2.

4.7 Switch delay

Activating switch delay leads to higher switch-off speeds when speeds are accelerating in the switching point. Before activating switch delay ensure the switch-off speed is not able to reach dangerously high speeds
(please refer to Chapter 4.3 switching deviation).

4.8 Slip angle detection

The switch remains open if the switch-off speed is reached within the set slip angle.

4.9 Diagnostic output

The diagnostic output is not a safety output.

4.10 Faults table

Faults	Possible cause	Remedy
Diagnostic switch does not close	No power supply Check basic unit: Green LED in terminal box not lit. Check electronic modules: No LEDs lit	Check connection cable and voltage supply
	No fault detected. Red LED on the EGS module lit.	Read out fault memory with EGS41Pro and implement corresponding corrective measures, if necessary. Finally, reset the fault. Please refer to the error table for a list of individual errors (Chapter 4.10)
Contact Hubner-Service (page 2) if none of the actions listed above provide a solution!		

4.11 Error table

Error message	Description
Dg_Intern [FFxx]	Device error
Dg_TempMain [0601, FE01]	Overtemperature in device
Dg_TempKK [0602, FE02]	Overtemperature in switch
Dg_ExtOv [0603, FE03]	Max. permissible supply voltage exceeded
Dg_n_Fatal [0604, FE04]	Non-permissible high speed
Dg_ExtUv [0605, FE05]	Below lowest permissible supply voltage
Dg_AbsErr [0606, FE06]	Flawed absolute value
Dg_IncErr [0607, FE07]	Flawed incremental value
Error [FExx]	Error
FatalError [FFxx]	Fatal error

Error category:

Error:
The switches S1, S2 and Diag are opened. To reset to the normal state interrupt the power supply via the reset input or click 'Delete error' in the software 'EGS41Pro'. The 'Delete error' command initiates a restart. If the error persists the device remains in the error state.

Fatal error:
The switches S1, S2 and Diag are opened. To reset to the normal state click "Delete error" in the software 'EGS41Pro'. The 'Delete error' command initiates a restart. If the error persists the device remains in the error state.

The device enters a 'safe state' in the event an error or fatal error occurs. In addition, the error causing the problem is displayed.

5 Transport, packaging and storage

5.1 Safety information concerning transport

CAUTION!
Material damage caused by improper transport!
Observe the symbols and information on the packaging:

- Do not throw - risk of breakage
- Keep dry
- Do not expose to heat above 40 °C or direct sunlight.

5.2 Goods inward inspection

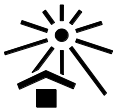
Check the delivery immediately upon receipt for transit damage or short delivery.
Inform the carrier immediately on receipt if you determine that damage has occurred during transit (take photos as proof).

5.3 Packaging (disposal)

The packaging is not taken back; dispose of according to the respective valid statutory provisions and local regulations.

5.4 Storing packages (devices)

Keep dry
Keep packages dry and free from dust; protect from moisture.



Protect against heat
Protect packages from heat above 40 °C and direct sunlight.

If you intend to store the device for a longer period of time (> 6 months) we recommend you use protective packaging (with desiccant).

NOTES!
Turn the shaft of the device every 6 month to prevent the bearing grease solidifying!

5.5 Returning devices (repairs/goodwill/warranty)

Devices that have come into contact with radioactive radiation or radioactive materials are not taken back.

Decontaminate devices that have may come into contact with harmful chemical or biological substances before returning.

They must also be accompanied by a safety clearance certificate.

5.6 Disposal

The manufacturer is not obliged to take back the device.

The device is classed as electronic equipment and subject to the WEEE Directive; observe local, country-specific laws when disposing of the device.

For information on environmentally sound disposal please contact your local authority or a specialist disposal company.

6 Certificate

ZERTIFIKAT
CERTIFICATE

Hiermit wird bescheinigt, dass die Firma / *This certifies, that the company*

Johannes Hübner
Fabrik elektrischer Maschinen GmbH
Siemensstraße 7
35394 Gießen
Deutschland

berechtigt ist, das unten genannte Produkt mit dem abgebildeten Zeichen zu kennzeichnen.
is authorized to provide the product mentioned below with the mark as illustrated.

Fertigungsstätte: *Manufacturing plant:*	**Johannes Hübner** **Fabrik elektrischer Maschinen GmbH** **Siemensstraße 7** **35394 Gießen** **Deutschland**
Beschreibung des Produktes: (Details s. Anlage 1) *Description of product:* *(Details see Annex 1)*	**Elektronischer Grenzdrehzahlschalter U-ONE** **(Basisgerät UOM(H) 41L-1212,** **LWL-Decoder UO-EM-D41,** **Grenzdrehzahlschaltermodul UO-EM-EGS41)** *Electronic overspeed switch U-ONE* *(Basic Unit UOM(H) 41L-1212,* *Fiber Optic Decoder UO-EM-D41,* *Overspeed Switch Module UO-EM-EGS41)*
Geprüft nach: *Tested in accordance with:*	**EN ISO 13849-1:2015 (PL d)** **EN 61508:2010 (SIL 2)**

Registrier-Nr. / *Registered No.* 44 207 14153107
Prüfbericht Nr. / *Test Report No.* 3519 7500
Aktenzeichen / *File reference* 8000470397

Gültigkeit / Validity
von / *from* 2017-03-13
bis / *until* 2022-03-12

Zertifizierungsstelle der
TÜV NORD CERT GmbH

Essen, 2017-03-13

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.de technology@tuev-nord.de

Bitte beachten Sie auch die umseitigen Hinweise
Please also pay attention to the information stated overleaf