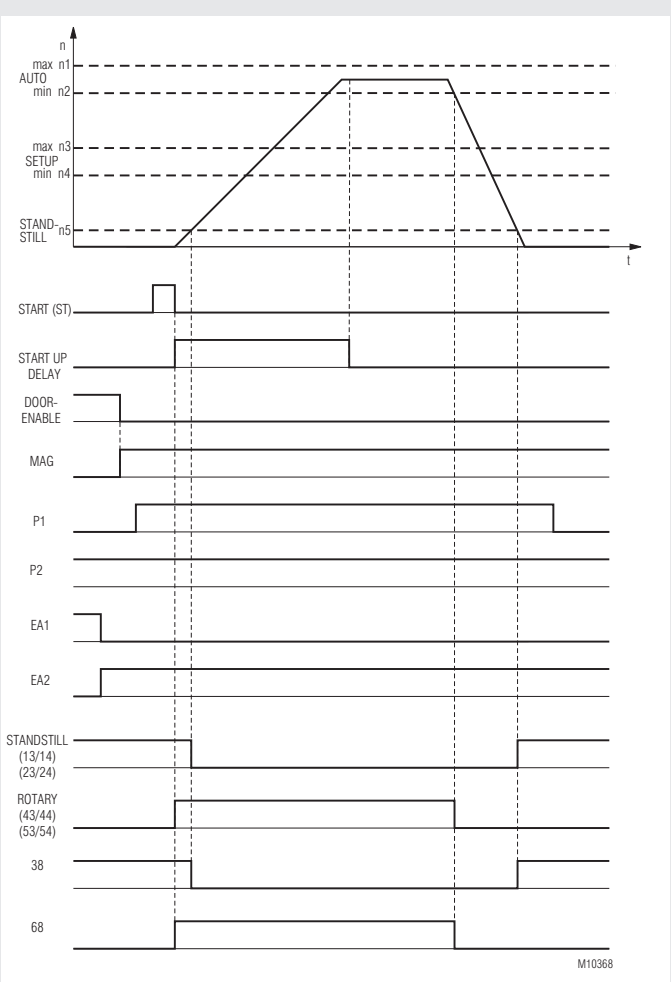
SAFEMASTER S
Speed Monitor
UH 5947

0263384

Product Description

The speed monitor UH 5947 provides safe monitoring of motors and rotating equipment. It is used in machines and plants where machine movements or moving parts can be a danger to men and machine. Using the front side display the parameters can be easily and comfortably adapted to the individual application or changed when necessary.

Function Diagram



Your Advantages

- Three in one
  - safe speed monitoring in automatic and set up operation
  - safe standstill monitoring
  - safe integrated gate monitoring
- For safety applications up to PL e / Cat 4 and SIL 3
- Space and costsaving, no external safe gate monitoring required
- Simple and time saving setup without PC
- Comfortable, menu guided configuration via frontside display
- Reducing interruption time in production by extensive diagnostic functions
- Easy to integrate in existing drive applications
- Suitable for all common motor feedback systems and proximity sensors
- Copy parameter settings in other units by pressing only a push button
- Higer safety by 2-channel mode selector, external connection
- With adjustable ratio between 2 sensors e.g. to detect a broken shaft
- Possible languages: english, german, french, italian, spanish

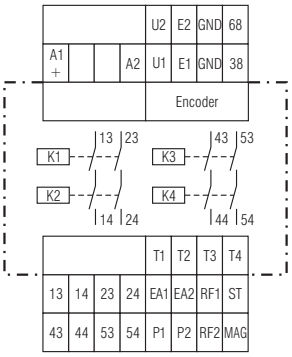
Features

- **According to**
  - **Performance Level (PL) e und category 4 to EN ISO 13849-1: 2008**
  - **SIL-Claimed Level (SIL CL) 3 to IEC/EN 62061**
  - **Safety Integrity Level (SIL 3) to IEC/EN 61508**
- According to EN 60204
- Device setting on menu-driven display or via RJ45 (FCC Western-Modular 8P8C) with connection cable (copy function)
- Change tracking
- Adjustable operation mode
  - Automatic mode: Monitoring of automatic rotational speed window and standstill speed.
  - Setup mode: Monitoring of setup rotational speed window. Standstill is permanently enabled.
- Single or 2-channel safety gate monitoring
- Integrated user friendly display for parameters and operation status
  - for set point and actual value of U/min or m/min
  - set point display also as frequency value
  - with numerous diagnostic features
- Adjustable start up delay (0 ... 999 s)
- Adjustable time delay for standstill detection (13/14, 23/24) (0 ... 999 s)
- Adjustable monitoring time for feedback circuit RF1 (0,5 ... 999 s)
- Monitoring of an release magnet
- Monitoring of feedback circuits
- Activation of the output path 43/44, 53/54 with on/off pushbutton with short circuit detection or automatic making function
- Adjustable PNP- or NPN-sensors
- Connection of different encodern possible (sin/cos, TTL, HTL)
- 2-channel function
- Forcibly guided contacts
- LED-indicators and 2 semiconductor monitoring output
- With pluggable terminal blocks for easy exchange of devices
  - with screw terminals
  - or with cage clamp terminals
- Width 45 mm

Approvals and Markings

CE · TÜVRheinland CERTIFIED Functional Safety Type Approved www.tuv.com ID 0600000000 · c UL us LISTED Canada / USA · A025518 · EAC

Circuit Diagram



M10325_a UH 5947.04

Connection Terminals

Terminal designation	Signal designation
A1 (+)	+ / L
A2	- / N
U1, U2	+ supply for proximity sensors or NAMUR-sensors
GND	- supply for proximity sensors
E1, E2	Input for pulse signal from proximity sensors or NAMUR-sensors
13, 14, 23, 24, 43, 44, 53, 54	Forcibly guided NO contacts for release circuit
38, 68	Semiconductor-monitoring output
T1, T2, T3, T4	Control output
ST, MAG, RF1, RF2, P1, P2, EA1, EA2	Control input

Application

This device is designed for machinery and installations where hazards to people and property may be caused by the movement of machines or parts.
The device permanently monitors for standstill (output circuit 13/14, 23/24) and rotational speed (output circuit 43/44, 53/54). For the rotational speed monitoring, it is possible to choose between automatic and setup mode.
If properly connected, the UH5947 can be used to implement the safety functions STO (safe torque off), SOS (safe operation stop), SLS (safely limited speed), SSM (safe speed monitoring), SSR (safe speed range), as well as SDL (safe door locking) as per standard EN 61800-5-2.

Functions

The device can be configured from the display and keys on the front plate or via RJ45 using a suited connection cable (see accessories) by means of the copy function.
Following measuring sensors can be used to sense the rotational speed:

- Two NPN or PNP proximity sensors (special version with NAMUR sensors) connected to the inputs E1 and E2. The proximity sensors (NAMUR sensors) are supplied with 24VDC from the speed relay to the terminal U1 and U2 (special version NAMUR 8.2V DC).
- Encoders (sin/cos, TTL, HTL) connected to the RJ45 interface via cable adapter (optionally available). The powersupply for the encoder is not provided by the speed monitor. Feedback influences should not occur.
- Combination from encoder and one proximity or NAMUR sensor for special version.

Indicator

DEVICE:	green	→ Run
	green-flashing	→ Parameterization mode
	red-flashing	→ Parameterization error
	red	→ Device fault
K1/K2:	green	→ Output contact 13/14, 23/24 closed
	green-flashing	→ Stop monitoring feedback loop 2 failed
K3/K4:	green	→ Output contact 43/44, 53/54 closed
	green-flashing	→ Stop monitoring feedback loop 1 failed
SF:	OFF	→ no failure
	red	→ (external) failure
DISPLAY:		→ Status indication
		→ Alarms / diagnostics
		→ Parameterization

Notes

ATTENTION - AUTOMATIC START!

According to IEC/EN 60 204-1 part 9.2.5.4.2 and 10.8.3 it is not allowed to restart automatically after emergency stop. Therefore the machine control has to disable the automatic start after emergency stop.

Technical Data

Input

Nominal voltage U_N:	AC/DC 110 ... 240 V, DC 24 V
Voltage tolerance	
AC/DC:	0.8 ... 1.2 U_N
DC:	0.9 ... 1.1 U_N
Nominal frequency (AC):	50 / 60 Hz
Frequency range (AC):	45 ... 65 Hz
max. residual ripple (DC):	48 %
Nominal consumption	
AC/DC:	< 6.5 W
DC:	< 5 W
Min. Off-time:	150 ms
Measuring accuracy:	± 2 %
Hysteresis:	6.25 %

Initiators

Input current:	DC 24 V (provided by the device)
Output:	as option PNP or NPN
Voltage on E1 and E2:	min. DC 10 V
Min. pulse duration e. g. on and off time:	75 µs
Setting range:	1 Hz ... 2 kHz

Encoder

Version:	with 2 signal paths (A, B) and their inverted signals ($\overline{A}$, $\overline{B}$))
Output:	as option TTL, HTL or sin/cos (U_A = 1 V_{PP}) When RJ45: Encoder is selected in setup routine under item 1.3 (sensor selection) a defined failure behaviour is necessary (high resistive outputs) in the case of missing powersupply or internal encoder failure. A forced dynamisation (t < 24 h) is necessary during longer standstill periods.
Setting range:	1 Hz ... 400 kHz

Technical Data

Special Version NAMUR

Supply voltage:	DC 8,2 V (provided by the device)
Input current:	max. 10 mA
Response value	
Low:	typ. 1,6 mA
High:	typ. 1,8 mA
Broken wire:	≤ 0,15 mA
Short circuit:	> 6,0 mA
Min. pulse duration e. g. on and off time:	75 µs
Setting range:	1 Hz ... 2 kHz

Output

Contacts	2 safe relay groups with each 2 NO contacts in series	
Contact:	Relay positive guide	
Thermal current I_{th}:	max. 5 A (see quadratic total current limit curve)	
Switching capacity		
to AC 15		
NO contact:	3 A / AC 230 V	IEC/EN 60 947-5-1
to DC 13		
NO contact:	1 A / DC 24 V	IEC/EN 60 947-5-1
to DC 13		
NO contact:	4 A / 24 V at 0.1 Hz	
Electrical life		
at 5 A, AC 230 V cos φ = 1:	≥ 1 x 10^5 switching cycles	IEC/EN 60 947-5-1
Short circuit strength		
max. fuse rating:	4 A gL	IEC EN 60 947-5-1
Mechanical life:	≥ 50 x 10^6 switching cycles	
Semiconductor monitoring output:	2 piece; 20 mA DC 24 V, plus switching	

Gerneral Data

Nominal operating mode:	continuous operation	
Temperature range		
Operation:	0 ... + 60 °C	
Storage:	- 20 ... + 70 °C	
Altitude:	< 2.000 m	
Clearance and creepage distance		
rated impulse voltage / pollution degree:	4 kV / 2	IEC 60 664-1
EMC	IEC/EN 62 061	
interference suppression:	Grenzwert Klasse B	EN 55 011
Degree of protection:	IP 20	IEC/EN 60 529
Housing:	thermoplastic with VO behaviour acc. to UL subject 94	
Vibration resistance:	Amplitude 0,35 mm frequency 10 ... 55 Hz,	IEC/EN 60 068-2-6
Climate resistance:	0 / 060 / 04	IEC/EN 60 068-1
Terminal designation:	EN 50 005	
Wire connection:		DIN 46 228-1/-2/-3/-4
Plug in with screw terminals		
max. cross section for connection:	1 x 0,25 ... 2,5 mm² solid or stranded ferruled (isolated) or 2 x 0,25 ... 1,0 mm² solid or stranded ferruled (isolated)	
Insulation of wires or sleeve length:	7 mm	
Terminal block with cage clamp terminals		
PC		
Cross section:	1 x 0.25 ... 2.5 mm² solid or stranded ferruled (isolated) 2 x 0,25 ... 1,5 mm² stranded twin ferruled (isolated)	
Insulation of wires or sleeve length:	10 mm	
PT		
Cross section:	1 x 0.25 ... 1.5 mm² solid or stranded ferruled (isolated)	
Insulation of wires or sleeve length:	8 mm	
Wire fixing:	captive slotted screw or cage clamp terminals	
Mounting:	DIN rail	IEC/EN 60 715
Weight:	approx. 420 g	

Dimensions

Width x height x depth:	45 x 107 x 121 mm

Technical Data

Safety Related Data

Values according to EN ISO 13849-1:

Category:	4	
PL:	e	
$MTTF_d$:	122	a (year)
DC_{avg}:	97,5	%
d_{op}:	365	d/a (days/year)
h_{op}:	24	h/d (hours/day)
t_{Zyklus}:	3600	s/Zyklus
	≙ 1	/h (hour)

Values according to IEC EN 62061 / IEC EN 61508:

SIL CL:	3	IEC EN 62061
SIL	3	IEC EN 61508
HFT*):	1	
DC_{avg}:	97,5	%
SFF	98,87	%
PFH_D:	3,02E-09	h^{-1}
T_1:	20	a (year)

*) HFT = Hardware-Failure Tolerance

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.

UL-Data

The safety functions were not evaluated by UL. Listing is accomplished according to requirements of Standard UL 508, "general use applications"

Nominal voltage U_N:	DC 24V AC/DC 110 ... 240 V (single or double phase) 50 / 60 Hz
Ambient temperature:	0 … +60°C
Switching capacity	
Semiconductor outputs:	24Vdc, 20mA, pilot duty
Switching capacity	
U_N = DC 24 V:	Pilot duty B300 5A 250Vac resistive only 2A 24Vdc resistive only Device must be supplied with a voltage / current limited power supply (max. 4 A)
Switching capacity	
U_N = AC/DC 110 ... 240 V:	
Ambient temperature 60°C:	Pilot duty B300 2A 250Vac resistive only
Ambient temperature 40°C:	Pilot duty B300 5A 250Vac resistive only
Wire connection:	60°C / 75°C copper conductors only
Plugin screw terminal:	AWG 28 - 12 Sol/Str Torque 0.5 Nm
Plugin cage clamp terminal:	AWG 24 - 12 Sol/Str
Plugin twin cage clamp terminal:	AWG 24 - 16 Sol/Str

Technical data that is not stated in the UL-Data, can be found in the technical data section.

EAC-Data

Nominal voltage U_N: DC 24V

Technical data that is not stated in the UL-Data, can be found in the technical data section.

Standard Type

UH 5947.04PS/61	DC 24 V
Article number:	0063476
• Safety output:	2 NO contacts for standstill monitoring 2 NO contacts for monitoring of speed range (window)
• Nominal voltage U_N:	DC 24 V
• Width:	45 mm

Variants

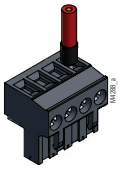
UH 5947.04_ _/001/61:	NAMUR-version
UH 5947.04_ _/101/61:	Sensor selection „E1+E2“: The semiconductor outputs give out the incoming signal of E1 with a ratio 1:2. Other sensor selection: The semiconductor outputs have no function.
UH 5947.04_ _/200/61:	The transistor outputs 38 and 68 are continuously on when the unit is on operation and are switched off as soon as a failure is detected

Order reference for variants

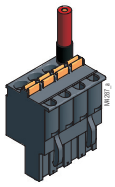
UH 5947.04 _ _ / _ _ _ _ _ / 61 DC 24 V

- Nominal voltage
- UL approval
- Variant, if reuired
- Customers specific factory setting, if reuired
- Type of terminals
  - PC (plug in cage clamp): pluggable terminal blocks with cage clamp terminals
  - PS (plug in screw): pluggable terminal blocks with screw terminals
  - PT (plug in Twin cage clamp): pluggable terminal blocks, with cage clamp terminals 2-wire
- Type

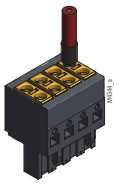
Options with Pluggable Terminal Blocks



Screw terminal (PS/plugin screw)



Cage clamp terminal (PC/plugin cage clamp)

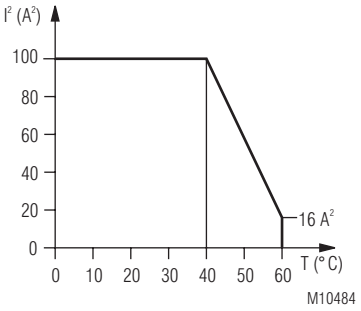


TWIN Cage clamp terminal (PT/plugin TWIN cage clamp)

Accessories

OA5947/100:	Connection cable for copy function and adaptor
KY5947 H1/S1:	15 pole adaptor to connect an encoder or for controllers of Siemens/Heidenhain with corresponding PIN arrangement (see remarks for accessories in operating manual)
KY5947 H2/S4:	25 pole adaptor to connect an encoder or for controllers of Siemens/Heidenhain with corresponding PIN arrangement (see remarks for accessories in operating manual)

Characteristics

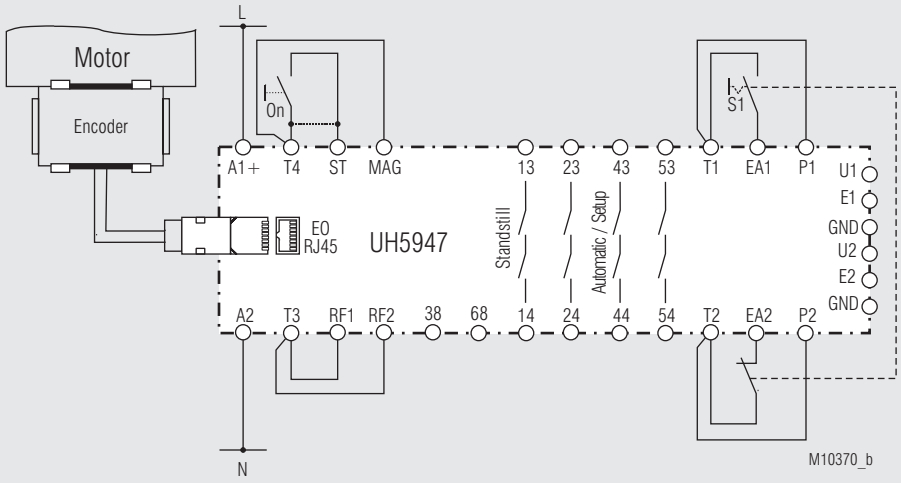


Max. zulässiger Strom bei 60°C über 4 Kontaktreihen = 2A ≙ $4x2^2A^2 = 16A^2$

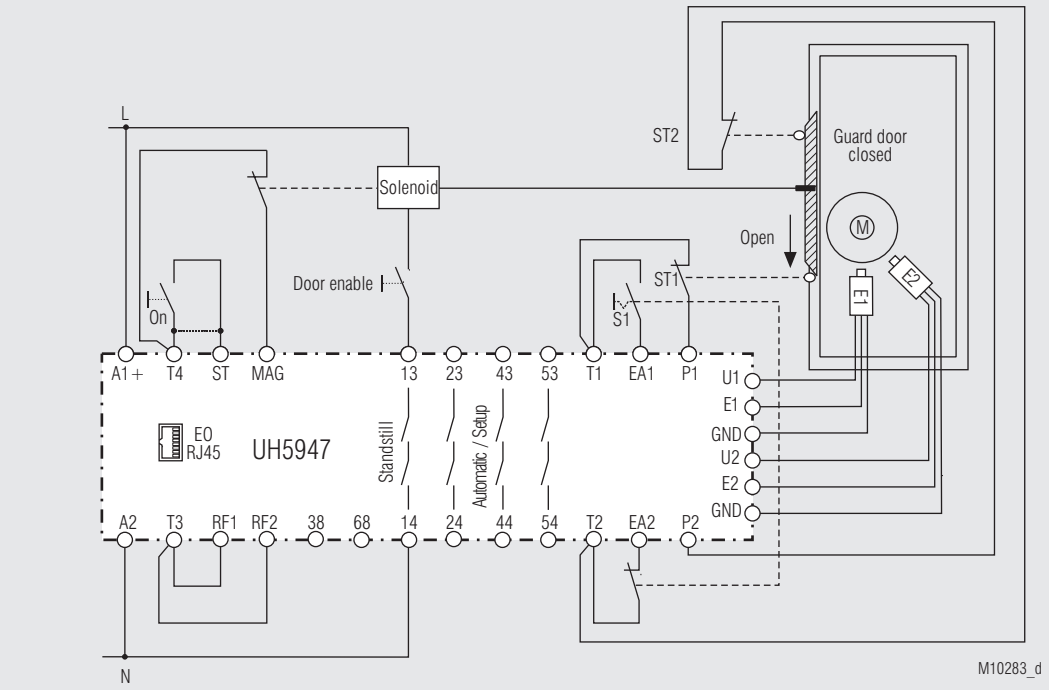
$I^2 = I_1^2 + I_2^2 + I_3^2 + I_4^2$

I_1, I_2, I_3, I_4- Strom in den Kontaktpfaden

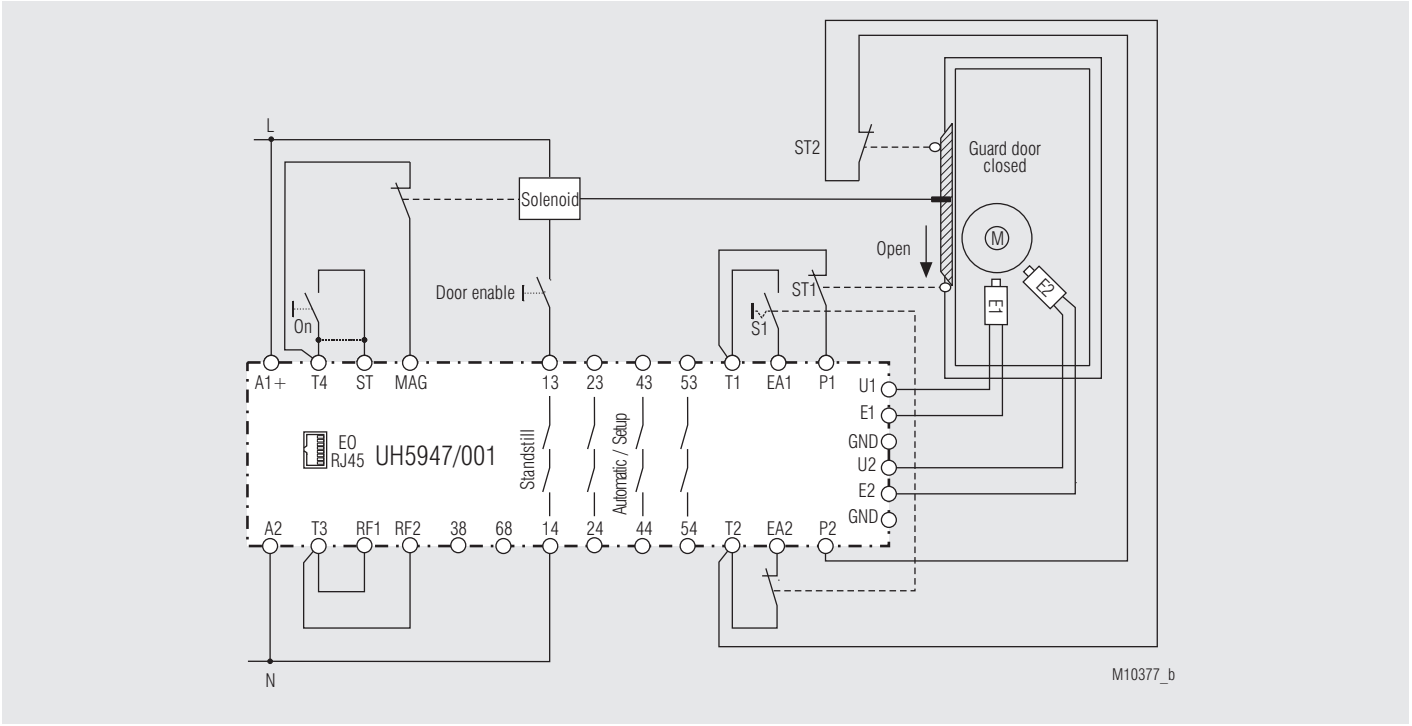
quadratic total current limit curve



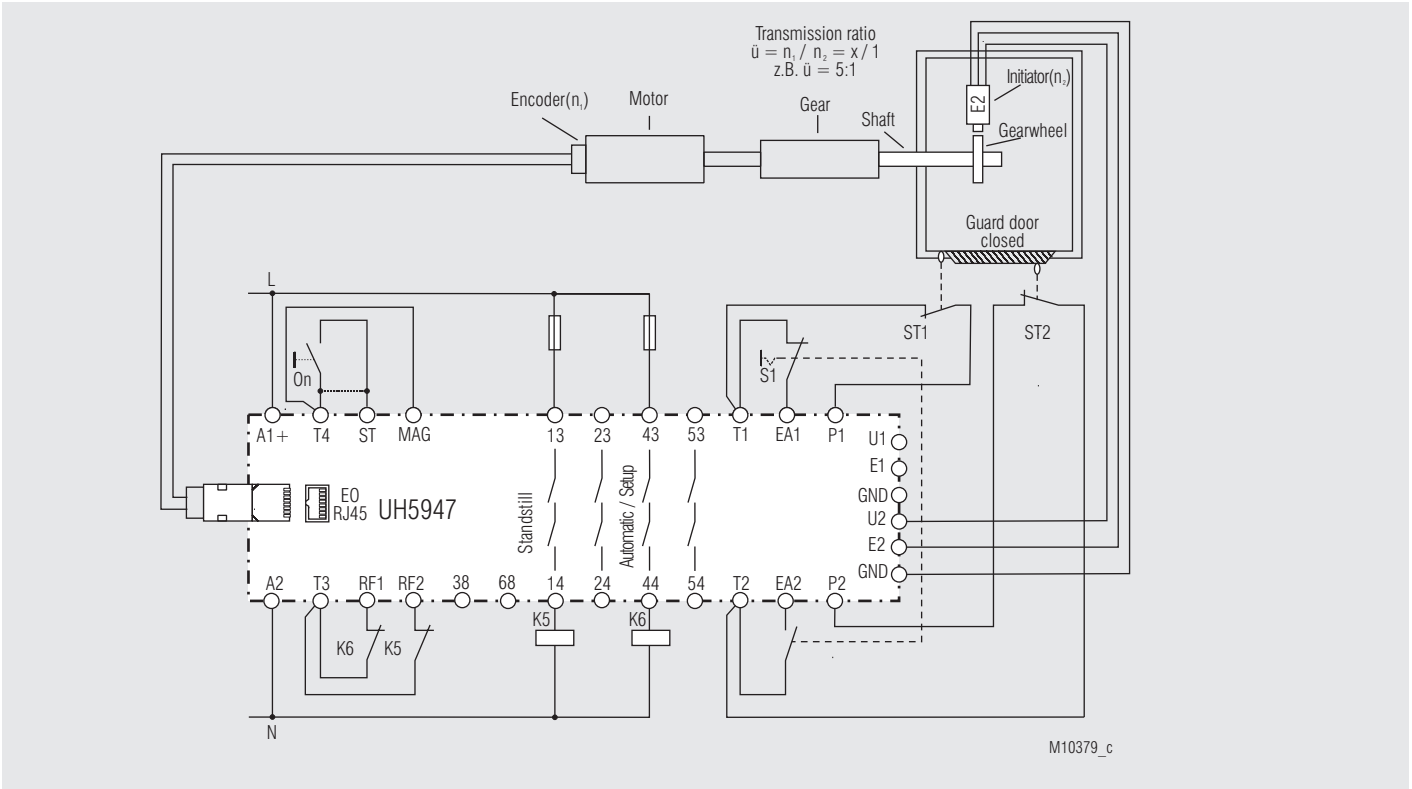
Rotational speed and standstill monitoring with suitable encoder, automatic mode; for manual start: ON/OFF pushbutton to T4/ST; for automatic start: jumper to T4/ST; suited up to SIL3, Performance Level e, Cat. 4 (Requirement for Cat. 4 is, that during longer periods of standstill a forced dynamisation (t < 24 h) has to be carried out).



Two-channel rotational speed and standstill monitoring by means of two NPN or PNP proximity sensors; automatic mode; safety gate monitoring active; for manual start: ON/OFF pushbutton to T4/ST; for automatic start: jumper to T4/ST; suited up to SIL3, Performance Level e Cat. 4 (Requirement for Cat. 4 is, that during longer periods of standstill a forced dynamisation (t < 24 h) has to be carried out).



Rotational speed and standstill monitoring by means of encoder and two NAMUR-sensor; automatic mode; safety gate monitoring active; for manual start: ON/OFF pushbutton to T4/ST; for automatic start: jumper to T4/ST; suited up to SIL3, Performance Level e; Cat. 4



Rotational speed and standstill monitoring by means of encoder and one NPN or PNP proximity sensor; setup mode; gear ratio set; safety gate monitoring active; for manual start: ON/OFF pushbutton to T4/ST; for automatic start: jumper to T4/ST; suited up to SIL3, Performance Level e, Cat. 4 (Requirement for Cat. 4 is, that during longer periods of standstill a forced dynamisation (t < 24 h) has to be carried out).