# Simply faster – Systematic handling

Systems | Actuators | Modules



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# 2 Introduction

Note: The machine manufacturer must check in advance that the required PL of the application is achieved with this module.

Please note that the speeds for each application must be calculated individually by the customer taking into account the reaction times.

Under certain circumstances, it may be necessary to use a deadman's switch or even a two-hand release.

The sample program provided is not a finished program suitable for every application. The programming, safety inspection and acceptance of the machine must be carried out by the customer. Afag Hardt GmbH assumes no liability that the components used here will achieve the required PL.

This application description shows how an eps EDP linear motor handling system can be operated at a safely reduced speed.

For each axis to be controlled, a servo controller with an STO input, an external path measuring system and a safety module are required.

In the example application, two speeds are defined for set-up operation. Reduced speed 1 is designed to work directly on the handling and reduced speed 2 is for observation with the safety door open.

The values for the safely reduced speeds were defined here for the Y-axis and Z-axis in the same way.

Reduced speed 2 may only be driven with an additional dead man's switch.

If the safety door is closed, the handling can move at maximum speed.

Safe limited speed 1	1 m/min	0.017 m/s
Safe limited speed 2	2 m/min	0.03 m/s

These speeds were determined for this test application on the basis of empirical values.

# 3 Explanation of terms

SLS	Safe Limited Speed	Sicher reduzierte Geschwindigkeit
STO	Safe Torque Off	Sichere Drehmomentabschaltung

# 4 Block diagram



# 5 How it works

To guarantee that speed is safely limited for setup mode, an additional safety module and additional external measuring system are used.

This safety module monitors the speed of handling with the help of the additional measuring system. If the previously defined maximum set-up speed is exceeded, the safety electronics switches off the release of the controller by means of safe contacts and the STO is triggered at the controller. The safety module monitors all signal channels of the measuring system and compares it with two processors for plausibility.

In addition to the monitoring by the safety module, the controller also compares the values of the internal and external measuring system. If a difference in position is detected, e.g. due to a cable break, the controller disconnects the load circuit via safety contactors.

The safety module also provides standstill monitoring. This can be utilized in various ways, e.g. to release the safety door lock.

# 6 Components used

# 6.1 Safeline safety PLC with

- Central module DNSL-ZMV 40ZM01
- Field bus module, e.g.
  - EtherCATDNSL-ECV 40EC03ProfibusDNSL-DPV 40DP04ProfinetDNSL-PNV 40PN03CANopenDNSL-COV 40CO03
- Drive monitoring module DNSL-DSV 2 40DS01 (for 2 axes) Note:

Up to 13 drive monitoring modules (for 26 axes) can be mounted in series

Central

Axis monitoring module



Field bus

6.2 Servo controller C1xx0-xx-XC-1S



#### 6.3 Linear path measuring system (for linear axes)

- Magnetic sensor MSK500 with filter ftaps4 (TTL 5 V)
- Magnetic tape MB500

#### Alternatively

- Magnetic sensor MSA501 (TTL 5 V)
- Magnetic tape MBA501
- Magnetic sensor MSK1000 with filter ftaps4 (TTL 5 V)
- Magnetic tape MB100



# 6.4 Encoder (for SE20)

• IE3 L with 128 pulses (TTL 5 V)

#### 6.5 Encoder (for RA-40 and SE30)

• IE3 L with 512 pulses (TTL 5 V)

# 7 Configuration and structure

Before a configuration is defined, the speeds must first be known.

Limited speed 1 (f <sub>Speed1</sub> )	1 m/min	0.017 m/s
Limited speed 2 (f <sub>Speed2</sub> )	2 m/min	0.03 m/s

In order to set the speed, the next step is to calculate the maximum frequency generated by the path measuring system while driving.

#### 7.1 Calculation for linear axes

#### 7.1.1 Sensor with 0.01 mm resolution

For this, we first need the resolution of the magnetic sensor (here 0.01 mm with 4x evaluation) s = 0,00001 m \* 4 = 0,00004 m

This creates a period length (s) of 0.00004 m.

The formula below can be used to calculate the frequency.

$$f_{Gesch} = \frac{v_{max}}{s} \qquad \qquad f_{Gesch} = \frac{0.017 \frac{m}{s}}{0.00004m} = 425Hz \qquad \qquad f_{Gesch^2} = \frac{0.03 \frac{m}{s}}{0.00004m} = 750 Hz$$

Since we want to drive at these speeds, we must enter approx. 10 percent more as the tolerance for this speed or frequencies.

$$f_{Gesch} = \frac{v_{max}}{s} + 10\% \qquad f_{Gesch} = \frac{0,017 \, \frac{m}{s}}{0,00004 \, m} + 10\% = 467,5Hz \qquad f_{Gesch} = \frac{0,03 \, \frac{m}{s}}{0,00004 \, m} + 10\% = 825 \, Hz$$

Since the axes also move minimally at 'standstill', a tolerance must also be taken into account here. This was set to 10 increments in the example. In environments that transmit strong vibrations to the handling system, this value must be increased so that a standstill can be signaled correctly.



#### 7.1.2 Sensor with 0.001 mm resolution

For this, we first need the resolution of the magnetic sensor (here 0.001 mm for 4x evaluation) s = 0,000001 m \* 4 = 0,000004 m

This creates a period length (s) of 0.000004 m.

The formula below can be used to calculate the frequency.

 $f_{Gesch} = \frac{v_{max}}{s} \qquad \qquad f_{Gesch} = \frac{0.017m/s}{0.000004m} = 4250Hz \qquad \qquad f_{Gesch 2} = \frac{0.03m/s}{0.000004m} = 7500 Hz$ 

Since we want to drive at these speeds, we must enter approx. 10 percent more as the tolerance for this speed or frequencies.

$$f_{Gesch} = \frac{v \max}{s} + 10\%$$

$$f_{Gesch1} = \frac{0.017 \ m/s}{0.000004 \ m} + 10\% = 4675 \ Hz$$

$$f_{Gesch2} = \frac{0.03 \ m/s}{0.000004 \ m} + 10\% = 8250 \ Hz$$

Since the axes also move minimally at 'standstill', a tolerance must also be taken into account here. This was set to 10 increments in the example. In environments that transmit strong vibrations to the handling system, this value must be increased so that a standstill can be signaled correctly.

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#### 7.2 Calculation for rotary axes

For this, we first need the number of increments of the measuring system and the reduction ratio of the gear of the unit.

#### 7.2.1 SE20 with 50:1 gear

The formula below can be used to calculate the frequency.

$$f_{Gesch} = \frac{Ink * i * v_{max}}{360 \circ}$$

$$f_{Gesch1} = \frac{128 * 50 * 17^{\circ} / s}{360 \circ} = 302,2Hz \qquad f_{Gesch2} = \frac{128 * 50 * 30^{\circ} / s}{360 \circ} = 533,3Hz$$

Since we want to drive at these speeds, we must enter approx. 10 percent more as the tolerance for this speed or frequencies.

$$f_{Gesch} = \frac{Ink * i * v_{max}}{360^{\circ}} + 10\%$$

$$f_{Gesch1} = \frac{128 * 50 * 17^{\circ}/s}{360^{\circ}} + 10\% \approx 335 \, Hz \qquad f_{Gesch2} = \frac{128 * 50 * 30^{\circ}/s}{360^{\circ}} + 10\% \approx 590 \, Hz$$

Since the axes also move minimally at 'standstill', a tolerance must also be taken into account here. This should be set to 34 Hz (approx.10% of reduced speed 1 (f<sub>Speed1</sub>)). In environments that transmit strong vibrations to the handling system, this value must be increased so that a standstill can be signaled correctly.

#### 7.2.1 SE20 with 30:1 gear

The formula below can be used to calculate the frequency.

$$f_{Gesch} = \frac{Ink * i * v_{max}}{360 \circ}$$

$$f_{Gesch1} = \frac{128 * 30 * 17^{\circ} / s}{360^{\circ}} = 181,3Hz \quad f_{Gesch2} = \frac{128 * 30 * 30^{\circ} / s}{360^{\circ}} = 320 Hz$$

Since we want to drive at these speeds, we must enter approx. 10 percent more than tolerance for this speed or frequencies.

$$f_{Gesch} = \frac{Ink * i * v_{max}}{360^{\circ}} + 10\%$$

$$f_{Gesch1} = \frac{128 * 30 * 17^{\circ}/s}{360^{\circ}} + 10\% \approx 200 \, Hz \qquad f_{Gesch2} = \frac{128 * 30 * 30^{\circ}/s}{360^{\circ}} + 10\% \approx 350 \, Hz$$

Since the axes also move minimally at 'standstill', a tolerance must also be taken into account here. This should be set to 20Hz (approx.10% of reduced speed 1 ( $f_{Speed1}$ )). In environments that transmit strong vibrations to the handling system, this value must be increased so that a standstill can be signaled correctly.



#### 7.2.2 RA-40 and SE30 with 50:1 gear

The formula below can be used to calculate the frequency.

$$f_{Gesch} = \frac{Ink * i * v_{max}}{360 \circ}$$

$$f_{Gesch1} = \frac{512 * 50 * 17^{\circ} / s}{360^{\circ}} = 1208,88 \, Hz \qquad f_{Gesch2} = \frac{512 * 50 * 30^{\circ} / s}{360^{\circ}} = 2133,33 \, Hz$$

Since we want to drive at these speeds, we must enter approx. 10 percent more than tolerance for this speed or frequencies.

$$f_{Gesch} = \frac{Ink * i * v_{max}}{360^{\circ}} + 10\%$$

$$f_{Gesch1} = \frac{512 * 50 * 17^{\circ} / s}{360^{\circ}} + 10\% \approx 1330 \text{ Hz} \quad f_{Gesch2} = \frac{512 * 50 * 30^{\circ} / s}{360^{\circ}} + 10\% \approx 2350 \text{ Hz}$$

Since the axes also move minimally at 'standstill', a tolerance must also be taken into account here. This should be set to 130 Hz (approx.10% of reduced speed 1 (f<sub>Speed1</sub>)). In environments that transmit strong vibrations to the handling system, this value must be increased so that a standstill can be signaled correctly.

#### 7.2.3 RA-40 and SE30 with 30:1 gear

The formula below can be used to calculate the frequency.

$$f_{Gesch} = \frac{Ink * i * v_{max}}{360^{\circ}}$$
$$f_{Gesch1} = \frac{512 * 30 * 17^{\circ} / s}{360^{\circ}} = 725,33 Hz \qquad f_{Gesch2} = \frac{512 * 30 * 30^{\circ} / s}{360^{\circ}} = 1280 Hz$$

Since we want to drive at these speeds, we must enter approx. 10 percent more than tolerance for this speed or frequencies.

$$f_{Gesch} = \frac{Ink * i * v_{max}}{360^{\circ}} + 10\%$$

$$f_{Gesch1} = \frac{512 * 30 * 17^{\circ} / s}{360^{\circ}} + 10\% \approx 800 \, Hz \qquad f_{Gesch2} = \frac{512 * 30 * 30^{\circ} / s}{360^{\circ}} + 10\% \approx 1410 \, Hz$$

Since the axes also move minimally at 'standstill', a tolerance must also be taken into account here. This should be set to 80 Hz (approx.10% of reduced speed 1 ( $f_{Speed1}$ )). In environments that transmit strong vibrations to the handling system, this value must be increased so that a standstill can be signaled correctly.

# 7.3 Settings of SL-VARIO Designer

Datei Parameter Projekt Ansicht Übertragung Hilfe 🗋 📟 📾 🚔 📀 SLVario V0344 Serätekonfiguration Logik Rack Diagnose + - 🔊 🍊 Online-Diagnose ZMV 0 FBV 1 DSV 2 DSV 3 DSV 4 Seite 1 Seite 2 Seite 3 Seite 4 Vario Parameter X Einstellung DNCO DNCO-SCANNER NOCKEN → Mutine Slot DZÜ DS1 DZÜ DS2 Anschlussklemmen F13 ZMV 00 J >>M12 I→ SRG Info1 Muting ohne Sensoriküberwachung Sicherer Stopp Schnellabschaltung an O3 1-fach Messung DzÜ\_1 ð. Name F12 Info2 FBV 01 erwachung Y-Achse Einlegehandling Beschreibung Stillsta 02 DSV Drehzahlüberwachung If STOP=1 => LR=1 Positionsüberwachung Ink 03 DSV -DNCO Kombination RS422 (Low ..... 💌 Encoder 04 DSV 0 ms Abschaltverzögerung Keine DNCO-Kombination -05 (sec) Sens.Überw.Verzög MSI Aktuelle Werte-Maschinendater 06 F13 🔵 🗖 N\$0115 Frequenz ⇒>M12 Antrieb ACHSE ₽ Clemme v N\$0114 07 Hz MT1 unendlich NEDIO Radi F13 Hz 1 Steigung 08 mm/Umdr ٢ F12 832.93 Hz Übersetzung 09 F11 470 Hz Lin Geber 10 nDS4. Ink. Rot. Geber 🖲 lnk/Umdr 10 F11-MT1 80 Hz Automatikbetrieb (F13) m/min • → >>M13 Drv5st 11 10 lnk. Sonderbetrieb (F12) 1 m/min Einrichtbetrieb (F11) 1 m/min 12 Manuell F13 🔵 🗖 Maschinendater Toleranz 0 % l >>M12 → SRG M11 Drv5 C 13 NEOTH 14 ок Abbruch

The settings are made using the SL-VARIO Designer software.

Note: After they are transferred, the frequencies are automatically changed. This comes from the frequency of the integrated quartz crystal.

# 8 Information about wiring

The different cards are connected directly with each other using special plug connectors. These plug connectors are used to realize the power supply of the individual modules and the communication with the central module.

# 8.1 Power supply of the safety PLC



#### 8.2 Emergency stop circuit

Central module

IO3	Emergency stop, clock		IN7	Input 1 for emergency
	output	<u> </u>		stop
IO4	Emergency stop, clock	÷	IN8	Input 2 for emergency
	output 2			stop

If the contacts are not needed, they can also be bridged directly.

#### 8.3 Safety door circuit

Central module

IO1	Safety door, clock output	IN5	Input 1 for safety door
	1		
102	Safety door, clock output	IN6	Input 2 for safety door
	2		

If the contacts are not needed, they can also be bridged directly.



# 8.4 Safe Torque Off (STO)

To ensure safety at reduced speed, it is important that the drive is switched off safely (STO). Therefore, it is important to use a double contact as shown in the connection diagram. The connection diagrams show 2 variants of how to wire the STO circuit.

#### 8.4.1 STO triggering for axes (Variant 1)

To trigger the STO for all axes simultaneously as soon as a safety violation occurs, the following connection diagram must be used.

Central module		Servo co	ontroller	
Q13	24 V			
Q14	X33.8	X33.8	Q14	
Q23	24 V			
Q24	X33.4	X33.4	Q24	
		X33.7	GND	 -
		X33.3	GND	
		13         14         A11A210102           17         16         Infiliation           17         12         Infiliation           11         12         14           12         14         14           14         14         10           15         10         10           15         10         10           15         14         15           15         14         14           16         14         14           16         15         14           17         15         14           15         15         14           15         14         15           16	GN	



# 8.4.2 STO triggering for a single axis (Variant 2)

The following connection diagram can be used to trigger the STO for individual axes as soon as a safety violation of the respective axis occurs.

Speed module		Servo controller 1		Servo controller 2	
Q4	X33.8(1)	X33.8	Q4		
Q5	X33.4(1)	X33.4	Q5		
Q6	X33.8(2)			X33.8	Q6
Q7	X33.4(2)			X33.4	Q7
		X33.7	GND		
		X33.3	GND		



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#### 8.5 Path measuring system

For the path measuring system, it is recommended to use the standard cable adapters. They split the signal lines of the path measuring system so that the signals are applied to both the servo controller and the safety PLC.

The cable adapter has 3 connections (Sub-D plug, 15-pin / Sub-D socket, 15-pin / RJ45 plug). It is connected directly to the servo controller with the Sub-D connector, to X13 of the servo controller. The magnetic sensor is plugged into the Sub-D socket. The RJ45 connector is connected to DS1 or DS2 of the respective speed card.



Connection diagram

# 9 Operation

#### 9.1 Selecting the operating mode

In our example, three operating modes are used: Reduced speed 1, reduced speed 2, and automatic mode (no monitoring of the speed).

The IN1, IN2 and IN3 inputs are available on the central module to select the respective operating modes. The inputs are activated by the 24 V connection.

The table below shows how to select which operating mode.

Inpu	ıts		Operating mode	
IN1	IN1 IN2 IN3			
	х		SLS 1	
		Х	SLS 2	
Х			Automatic mode	
(24 V is always applied to X)				



#### 9.2 Switching between the operating modes

To achieve a safe operating state, the SLS must be selected with the safety door open. Otherwise, the STO is automatically triggered at the servo controller and the axis is therefore de-energized.



If required, the changeover from automatic to SLS can be delayed via the timers.

It must be noted that the SLS is only active after the times ZW3/ZW1 have elapsed. This may give rise to potential problems:

Times too long: Safe operation cannot be guaranteed

Times too short: Axles cannot be braked fast enough to the safe speed  $\rightarrow$  Violation of the SLS  $\rightarrow$  STO  $\rightarrow$  Axles are de-energized.

The time ZW2 should always be set approx. 10% higher than ZW1/3/4.



#### 9.2.1 Important information

- 1. In automatic mode, the emergency stop circuit and the safety door circuit must be closed
- 2. In SLS mode, the emergency stop circuit must be closed
- 3. If an enabling switch is used, it must also be actuated when switching to SLS operation. If this is not actuated, this automatically leads to an STO.
- 4. Braking can be implemented using a corresponding run command via the PLC. For example, an absolute run command can be sent with the same target position and limited speed, acceleration and deceleration.

Alternatively, the /Abort function (control word) can be used. This function is then assigned to a digital input of the servo controller. This function completely decelerates the axle, but then the control remains active.

The /Quickstop should <u>not</u> be used, as it automatically leads to an STO.

#### Note: The digital inputs on the controller are not safe inputs!

#### 9.3 Resetting the safety PLC

If an error has occurred, e.g. due to exceeding the speed, the safety PLC requires a reset. This can be carried out either via the IN4 input on the central module or via the field bus (FBI1.1). If you do not want to carry out a reset, but want the safety PLC to carry it out automatically, you can set the IN4 input to 24 V. However, no errors are output during an automatic reset.

	•	· · · ·
Reset	IN4 central module	
		ZMV 0 IN Reset
Reset	Field bus input FBI1.1	
		HERV 1 Les FB1.1 Junidad
		(FBI1.1.Reset
		1\$0705
		2 F

# 9.4 Display of the operating state

#### **Digital outputs**

Cen	tral module			Axis mo	onitoring module	TEET
Q1	Stop for changeover from	2020 2020		Q1	Standstill, axis 1	2222
	automatic to SLS (Abort)	H 12 13 14 A1 A2 01 02 15 16 17 18 101102103104 DIA A1/A2: 4A/24V DC				11 12 13 14 15 16 17 18
Q2	Standstill	ELEKTRONIK D 72649 WOLFSCHLUGEN 0: 101-4: 24V/4mA 0: 101-4: 0.1A		Q4/5	Axis 1 OK	ELEKTRONIK D72549 WOLFSCHLIGEN H-8:
Q3	Error	11 2 3 4 Pwr 012 USB PORT 15 6 7 8 1012 3 4	Standstill, axis 2	01-7: 11 2 3 4 1A/23.5A 0 0 0 15 6 7 8		
		4K3 4 5 6 1021(G2SPEED 2-HAND EN 574:IIIC 19 10 11 12 03 4 5 6		Q6/7	Axis 2 OK	SPEED 102102 2-HAND EN574 IIC P 01 2 3
		TR< 50mS 131415 16 K1 K2 SLVARID AC15 3A/230V/Σ4A DNICI 700V/Σ4A	1	Attenti		
		DINSL-ZMV ID-No: 40ZM01 01- 6: 1ΑΣ3Α 19 1101 111 112 03 04 05 106 1132 141 145 113 141238 24	se the " STO triggering for a	DNSL-DSV ID-No: 40DS01 P3W 01 02 03		
				single a		
				your PL		
				against	inductive loads.	
				_		

# **10 Field bus assignment – input/output**

# 10.1 Input bytes

FBI1.1	Reset
FBI1.2	Free
FBI1.3	Free
FBI1.4	Free
FBI1.5	Free
FBI1.6	Free
FBI1.7	Free
FBI1.8	Free

All other input bytes are not occupied.



# 10.2 Output bytes

FBO1.1	Error, axis 1	FBO2.1	Error axis 9
FBO1.2	Error, axis 2	FBO2.2	Error, axis 10
FBO1.3	Error, axis 3	FBO2.3	Error, axis 11
FBO1.4	Error, axis 4	FBO2.4	Error, axis 12
FBO1.5	Error, axis 5	FBO2.5	Error, axis 13
FBO1.6	Error, axis 6	FBO2.6	Error, axis 14
FBO1.7	Error, axis 7	FBO2.7	Error, axis 15
FBO1.8	Error, axis 8	FBO2.8	Error, axis 16
FBO3.1	Error, axis 17	FBO4.1	Standstill, axis 1
FBO3.2	Error, axis 18	FBO4.2	Standstill, axis 2
FBO3.3	Error, axis 19	FBO4.3	Standstill, axis 3
FBO3.4	Error, axis 20	FBO4.4	Standstill, axis 4
FBO3.5	Error, axis 21	FBO4.5	Standstill, axis 5
FBO3.6	Error, axis 22	FBO4.6	Standstill, axis 6
FBO3.7	Error, axis 23	FBO4.7	Standstill, axis 7
FBO3.8	Error, axis 24	FBO4.8	Standstill, axis 8
FBO5.1	Standstill, axis 9	FBO6.1	Standstill, axis 17
FBO5.2	Standstill, axis 10	FBO6.2	Standstill, axis 18
FBO5.3	Standstill, axis 11	FBO6.3	Standstill, axis 19
FBO5.4	Standstill, axis 12	FBO6.4	Standstill, axis 20
FBO5.5	Standstill, axis 13	FBO6.5	Standstill, axis 21
FBO5.6	Standstill, axis 14	FBO6.6	Standstill, axis 22
FBO5.7	Standstill, axis 15	FBO6.7	Standstill, axis 23
FBO5.8	Standstill, axis 16	FBO6.8	Standstill, axis 24
FBO7.1	Free	FBO8.1	Error
FBO7.2	Free	FBO8.2	Standstill of all axes
FBO7.3	Free	FBO8.3	Muting input status
FBO7.4	Free	FBO8.4	Limited speed 1 input status
FBO7.5	Free	FBO8.5	Limited speed 2 input status
FBO7.6	Free	FBO8.6	Free
FBO7.7	Free	FBO8.7	Free
FBO7.8	Free	FBO8.8	System OK

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# 11 SL-VARIO Designer software

The safety PLC is programmed with the SL-VARIO Designer software – V0344 that is supplied free of charge.

This description is only intended as a rough guide. A detailed description can be found on the CD supplied by the manufacturer and on the flash drive in the central module.

#### Note:

In order to perform an online diagnosis of the program, the version stored on the PC must be identical to that on the safety PLC.

#### 11.1 System prerequisites

- Operating system: Windows XP, Windows Vista, Windows 7, Windows 8 (only after consultation with DINA)
- Main memory: min. 512 MB
- JAVA Runtime Environment (JRE): Min. version 6, Update 16
- USB port
- Connecting cable: To establish a connection to the central module, a conventional USB cable (A plug to B mini plug) is required. This is connected to the mini USB socket labeled 'USB PORT'.





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# 11.3 Transferring the program/settings

SLVario * - Prj34_8479_5-Achsen_20150120.slw3	pplikation übertragen
Datei Parameter Projekt Ansicht Übertragung Hilfe	COM PORT
+ - S C Online-Diagnose ZMV 0 FBV 1 DSV 2 DSV 3 E	COM-Port TEST Refresh COM-Port List
Sette 1 Sette 2 Sette 3 Sette 4	Applikationsdaten Autostart Verifikation Name Max Autor 210115 Datum
	Firmware Vergleichstest
<b>Note:</b> The transfer can take up to 5 minutes.	Verzeichnis Muster.slw3 Dateiname
	Mittwoch, 21. Januar 2015 10:08:15 Zeitstempel

11.4 Setting the field bus address

	SLVario Parameter											
Gerätekonfiguration Logik Rack Diagnose	Einstellungen DNCO DNCO-SCANNER NOCKEN											
SLVario-ZMV	Slot Parameter Eingänge Ausgänge 1 Ausgänge 2 FB-LZ-Diag											
SLVario-FBV	01     FBV     Name     Image: Baudrate stations adresse     Image: Baudrate station stat											
SLVario-DSV - 6 frei - 7 frei - 8 frei - 9 frei	03     DSV     Image: Section of the section o											
SLVario-DRV	05 Bei FB-Störung ZM FB-Eingangsbits nicht löschen											
SLVario-INV												
	09											

OK

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# 12 Please note

Depending on the mode, motor used and wiring, there can be different response times. The safety module requires approx. 11 ms from detection of the excessive speed to the falling edge at the output with '1x measurement' and active rapid switch-off directly in the speed monitoring module (semiconductor output Q3). If the relay contact on the central module is used, this time increases accordingly.

The time until the STO relay on the controller itself drops out must also be taken into account in the customer's safety consideration, and is between 3 ms and 20 ms depending on the external wiring.



# 13 Achievable performance level

The redundant design and monitoring of all safety-relevant components and the speed monitoring on the safety PLC ensure one-fault safety.

This enables required performance level 'd' to be achieved.

The wiring must be implemented as shown in the following wiring diagram.



# 14 Notes


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# **15 Support**

#### Afag Hardt GmbH

Gewerbestraße 11D-78739 Hardt, GermanyPhone+49 (0)7422/56003-20E-mailsupport.hardt@afag.comInternethttp://www.afag.com

Afag Hardt GmbH Gewerbestraße 11 D-78739 Hardt, Germany Phone +49 (0)7422/56003-0 Telefax +49 (0)7422/56003-29 E-mail info.hardt@afag.com Internet http://www.afag.com