

Standstill monitoring

AZR 31 S1



- Sensor-free detection of standstill by monitoring e.m.f.
- Direct connection to three-phase motors
- Suitable for connection to a frequency converter with the following interface data: rotary hysteresis 0 ... 1000 Hz; switching frequency of the end level up to 16 kHz; engine voltage range 0 ... 400 V
- 3 enabling paths, Stop 0
- 1 indication contact (NC)
- No reference value setting required
- Wire-breakage monitoring of measuring inputs
- Self-test with fault memory
- Cyclic self-testing
- 5 LEDs to show operating conditions
- Control Category 4 to EN 954-1
- Plug-in terminals

Technical data

Standards:	IEC/EN 60204-1, EN 954-1, BG-GS-ET-20
Control category:	4
Enclosure:	glass-fibre reinforced thermoplastic
Connection:	plug-in, screw terminals
Cable section:	max. 2.5 mm ² solid or multi-strand lead (incl. conductor ferrules)
U _e :	24 VDC – 15 % / + 20 % 24 VAC ± 10 % 110 VAC ± 10 % 230 VAC ± 10 %
Frequency range:	50/60 Hz (on AC operational voltage)
I _e :	0.13 A (DC version)
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
Power consumption:	max. 3 W
Max. fuse rating:	Glass fuse F1, tripping current 315 mA (U _e 24 VAC/DC) tripping current 80 mA (U _e 110 VAC) tripping current 40 mA (U _e 230 VAC)
Monitored inputs	3-phase motor L1, L2, L3: 400 VAC
Feedback circuit:	yes
Utilisation category:	AC-15, DC-13
Enabling contacts:	3 enabling paths
Switching capacity:	enabling paths: 6 A/230 VAC, 6 A/24 VDC
Signalling output:	1 NC contact
Switching capacity:	Indicating contact: 2 A/24 VDC
Test cycle time:	8 seconds (2 seconds optionally)
Switch-off time:	< 15 ms (< 130 ms on supply failure)
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	– 25 °C ... + 70 °C
Function display:	5 LEDs
Weight:	400 g
Dimensions:	45 x 73.2 x 121 mm

Approvals



Ordering details

AZR 31 S1 ①

No.	Replace	Description
①	24VDC	24 VDC
	24VAC	24 VAC
	110VAC	110 VAC
	230VAC	230 VAC

Note

Test cycle time: time between the standstill detection and enabling of the enabling paths

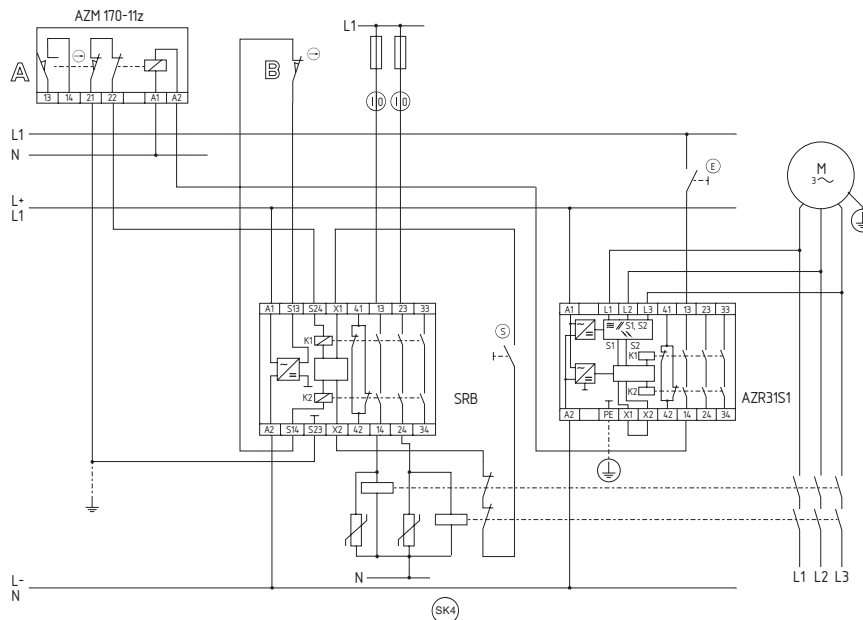
Pole pair/ Number of motors	zero-axis crossing, per revolution	standstill detection,	
		Device with 2 s Test cycle time [h/min]	standstill detection, Device with 8 s test cycle time [h/min]
1	2	15.00	3.75
2	4	7.50	1.88
4	8	3.75	0.94
6	12	2.50	0.63
8	16	1.88	0.47

Standstill monitoring

Note

- The sensor-free standstill monitor checks the e.m.f. of the three phase motor.
- Monitors a guard door to Control Category 4 to EN 954-1
- The SRB range guard door monitor checks the position of the guard door. The function of the guard door monitor is described in chapter 5.
- Monitoring the guard door using a solenoid interlock and a safety switch with separate actuator (A and B).
- Release takes place by means of the NO contact only when the run-down movement has been terminated (E).
- After release has taken place, the guard door must be opened.

Wiring diagram



LED

Function indication:

The integrated LEDs indicate the following operating states.

- Position relay K1/ K2, green (out)
- Input signal channel A, red (A)
- Input signal channel B, red (B)
- Error channel A and B, red (err)
- Supply voltage U_B , green (on)

Note

The wiring diagram is shown with guard doors closed and in de-energised condition.

This fail-safe standstill monitor has the particular advantage that no adjustment for a required-value is needed during commissioning.

Standstill monitoring

FWS 1205






- Detects standstill using 1 or 2 impulse sensors
- Control Category 3 to EN 954-1
- Operating voltage 24 VDC
- 2 enabling paths
- Reset input
- 2 short-circuit proof additional transistor outputs
- ISD Integral System Diagnostics
- 2 channel microprocessor controlled
- Customer-specific standstill frequencies possible

Technical data

Standards:	EN 60204-1, EN 954-1, BG-GS-ET-20
Control category:	3
Start conditions:	Automatic
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Mounting:	snaps onto standard DIN rail to EN 50022
Connection:	screw terminals
Cable section:	max. 2.5 mm ² (incl. conductor ferrules)
Protection class:	enclosure IP 20 to EN 60529
U _e :	24 VDC ± 15%
I _e :	0.2 A
Monitored inputs	2 channels, pulse generator p-type
Input resistance:	approx. 4 kΩ to ground
Input signal „1“:	10 ... 30 VDC
Input signal „0“:	0 ... 2 VDC
Max. cable length:	100 m of 0.75 mm ² conductor
Enabling contacts:	2 enabling paths
Utilisation category:	AC-15, DC-13
I _e /U _e :	3 A / 230 VAC 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 6 A (cos φ = 1)
Max. fuse rating:	6 A gG D-fuse
Signalling output:	2 transistor outputs, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof
Function display:	LED (ISD)
EMC rating:	conforming to EMC Directive
Standstill frequency:	version A: input X1/X2: 1 Hz/2 Hz version B: input X1/X2: 2 Hz/2 Hz version C: input X1/X2: 1 Hz/1 Hz
Hysteresis:	10 % of standstill frequency
Max. input frequency:	4000 Hz
Min. pulse duration:	125 μs
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Resistance to vibration:	10 ... 55 Hz / amplitude 0.35 mm
Resistance to shock:	30 g / 11 ms
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	- 25 °C ... + 70 °C
Dimensions:	22.5 x 100 x 121 mm
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Approvals

   in preparation



Ordering details

FWS 1205 ①

No.	Replace	Description
①		Standstill frequencies Inputs X1/X2:
	A	1 Hz/2 Hz
	B	2 Hz/2 Hz
	C	1 Hz/1 Hz

Function table

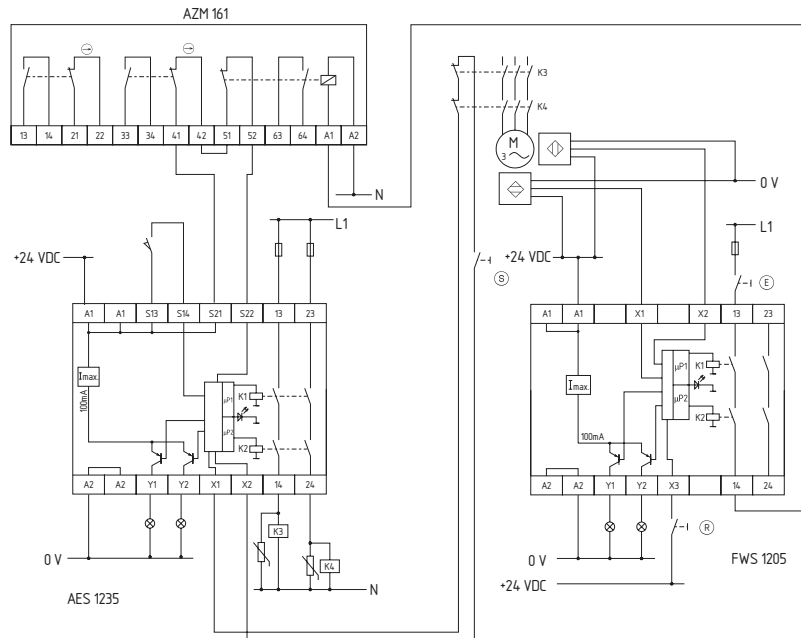
Additional transistor output:	Function:
Y1	Authorized operation, enabling paths closed
Y2	Fault, high signal

Standstill monitoring

Note

- FWS to monitor one guard door at plants with dangerous run-on movements up to control category 3 to EN 954-1
- Standstill monitoring for unlocking solenoid interlocks
- The solenoid interlock can be opened, when the standstill monitor has detected the end of the run-on movement by means of one or two inductive proximity switches. When the button \ominus is actuated, the solenoid of the solenoid interlock is energised.
- If only one inductive proximity switch is connected to the standstill monitor, the standstill frequencies must be identical and inputs X1 and X2 must be bridged
- For suitable IFL range p-type inductive proximity switches, refer to „Schmersal Catalogue Automatisierungstechnik“.

Wiring diagram



ISD

The following faults are recognised by safety monitoring module and indicated by the ISD

- Interruption of the connections to the inductive proximity switches
- Failure of the proximity switches
- Failure of one channel being evaluated
- Failure of safety relay to pull-in or drop-out
- Faults on input or relay control circuits of the safety monitoring module

Note

The wiring diagram is shown with guard doors closed and in de-energised condition.

The ISD tables (Integral System Diagnostics) for analysis of the fault indications and their causes are shown in the appendix.

Standstill monitoring

FWS 1206






- Detects standstill using 1 or 2 impulse sensors
- Uses additional standstill signal, e.g. PLC as second input channel
- Control Category 3 to EN 954-1
- Operating voltage 24 VDC
- 2 enabling paths
- Reset input
- 2 short-circuit proof additional transistor outputs
- ISD Integral System Diagnostics
- 2 channel microprocessor controlled
- Customer-specific standstill frequencies possible

Technical data

Standards:	EN 60204-1, EN 954-1, BG-GS-ET-20
Control category:	3
Start conditions:	Automatic
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Mounting:	snaps onto standard DIN rail to EN 50022
Connection:	screw terminals
Cable section:	max. 2.5 mm ² (incl. conductor ferrules)
Protection class:	enclosure IP 20 to EN 60529
U _e :	24 VDC ± 15%
I _e :	0.2 A
Monitored inputs	1 or 2 channels, pulse generator p-type
Input resistance:	approx. 4 kΩ to ground
Input signal „1“:	10 ... 30 VDC
Input signal „0“:	0 ... 2 VDC
Max. cable length:	100 m of 0.75 mm ² conductor
Enabling contacts:	2 enabling paths
Utilisation category:	AC-15, DC-13
I _e /U _e :	3 A / 230 VAC 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 6 A (cos φ = 1)
Max. fuse rating:	6 A gG D-fuse
Signalling output:	2 transistor outputs, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof
Function display:	LED (ISD)
EMC rating:	conforming to EMC Directive
Standstill frequency:	version A: input X1/X2: 1 Hz/2 Hz version C: input X1/X2: 1 Hz/1 Hz
Hysteresis:	10 % of standstill frequency
Max. input frequency:	4000 Hz
Min. pulse duration:	125 μs
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Resistance to vibration:	10 ... 55 Hz / amplitude 0.35 mm
Resistance to shock:	30 g / 11 ms
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	- 25 °C ... + 70 °C
Dimensions:	22.5 x 100 x 121 mm
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Approvals

   in preparation



Ordering details

FWS 1206 ①

No.	Replace	Description
①		Standstill frequencies Inputs X1/X2:
	A	1 Hz/2 Hz
	C	1 Hz/1 Hz

Function table

Additional transistor output: Function:

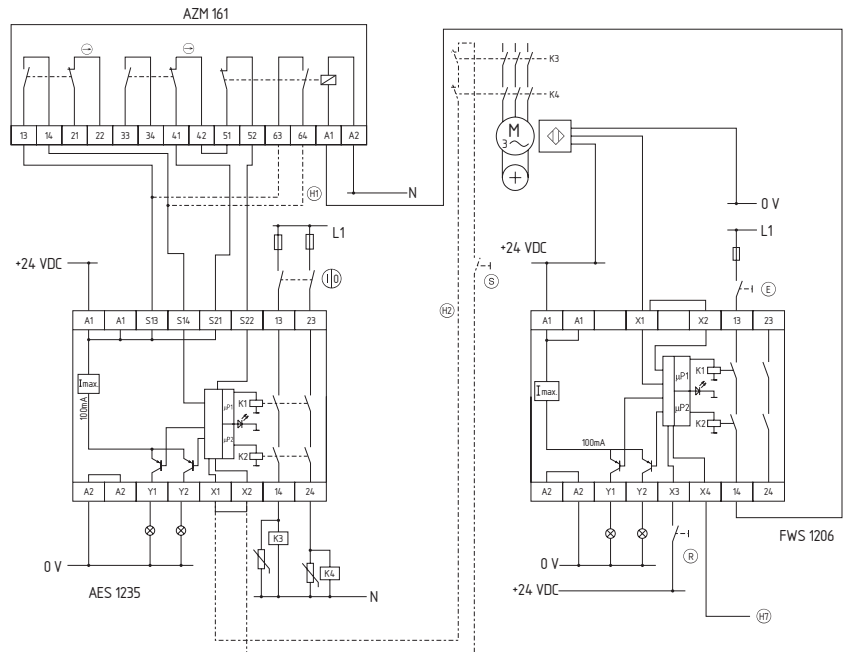
Y1	Authorized operation, enabling paths closed
Y2	Fault, high signal

Standstill monitoring

Note

- FWS to monitor one guard door at plants with dangerous run-on movements up to control category 3 to EN 954-1
- Standstill monitoring for unlocking solenoid interlocks
- The solenoid interlock can be opened, when the standstill monitor has detected the end of the run-on movement by means of one or two inductive proximity switches as well as the supplementary standstill signal HT . When the button E is actuated, the coil of the solenoid interlock is energised.
- If only one inductive proximity switch is connected to the standstill monitor, the standstill frequencies must be identical and inputs X1 and X2 must be bridged (only version C)
- For suitable IFL range p-type inductive proximity switches, refer to „Schmersal Catalogue Automatisierungstechnik“.

Wiring diagram



ISD

The following faults are recognised by safety monitoring module and indicated by the ISD

- Interruption of the connections to the inductive proximity switches
- Failure of the proximity switches
- Failure of one channel being evaluated
- Failure of safety relay to pull-in or drop-out
- Faults on input or relay control circuits of the safety monitoring module

Note

The wiring diagram is shown with guard doors closed and in de-energised condition.

The ISD tables (Integral System Diagnostics) for analysis of the fault indications and their causes are shown in the appendix.

Standstill monitoring

FWS 2316



- Detects standstill using 1 or 2 impulse sensors
- Control Category 3 to EN 954-1
- 3 enabling paths
- Available for various operating voltages
- Cross-wire detection by means of pulsed supply voltage of proximity switches
- Reset input
- short-circuits proof additional transistor output
- ISD Integral System Diagnostics
- 2 channel microprocessor controlled
- Customer-specific standstill frequencies possible

Technical data

Standards:	EN 60204-1, EN 954-1, BG-GS-ET-20
Control category:	3
Start conditions:	Automatic
Enclosure:	glass-fibre reinforced thermoplastic
Mounting:	snaps onto standard DIN rail to EN 50022
Connection:	screw terminals
Cable section:	max. 4 mm ² (incl. conductor ferrules)
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
U _e :	24 VDC ± 15 % 110 VAC, 230 VAC
I _e :	0.3 A (DC version)
Monitored inputs	2 channels, pulse generator p-type
Input resistance:	approx. 2 kΩ to ground
Input signal „1“:	10 ... 30 VDC
Input signal „0“:	0 ... 2 VDC
Max. cable length:	100 m of 0.75 mm ² conductor
Standstill frequency:	version C: input X2/X4: 1 Hz/1 Hz other versions: on request
Hysteresis:	10 % of standstill frequency
Max. input frequency:	1000 Hz
Min. pulse duration:	500 μs
Utilisation category:	AC-15, DC-13
Enabling contacts:	3 enabling paths
I _e /U _e :	3 A / 250 VAC 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 6 A (cos φ = 1)
Max. fuse rating:	6 A gG D-fuse
Signalling output:	2 transistor outputs, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof
Function display:	LED (ISD)
EMC rating:	conforming to EMC Directive
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Resistance to vibration:	10 ... 55 Hz / amplitude 0.35 mm
Resistance to shock:	30 g / 11 ms
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	- 25 °C ... + 70 °C
Dimensions:	55 x 75 x 110 mm
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Approvals



Ordering details

FWS 2316.①②

No.	Replace	Description
①		24 VDC
	1	110 VAC
	2	230 VAC
②		Standstill frequencies
		Inputs X3/X5:
	B	2 Hz/2 Hz
	C	1 Hz/1 Hz

Function table

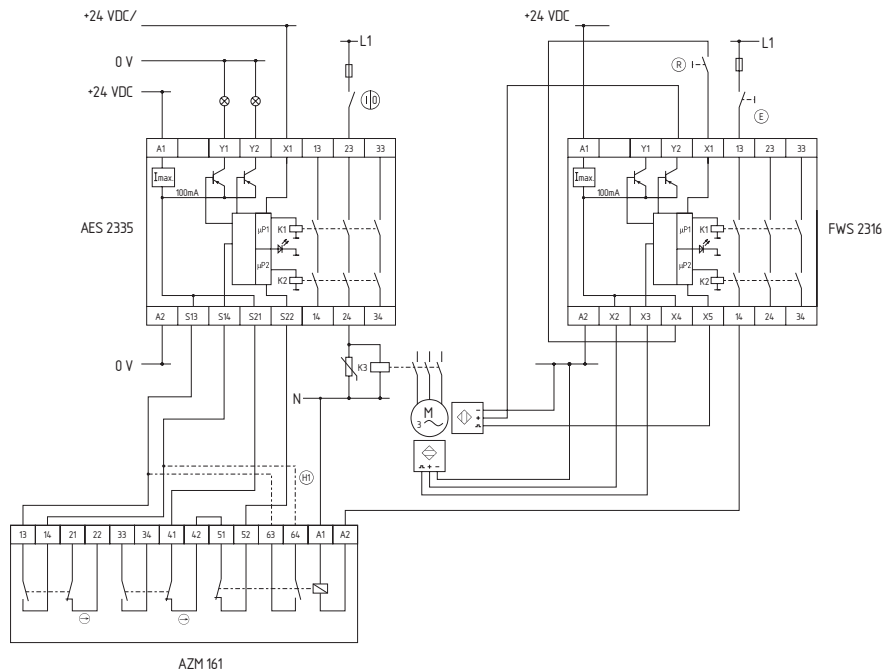
Additional transistor output:	Function:
Y1	Authorized operation, enabling paths closed

Standstill monitoring

Note

- FWS to monitor one guard door at plants with dangerous run-on movements up to control category 3 to EN 954-1
- Standstill monitoring for unlocking solenoid interlocks
- The solenoid interlock can be opened, when the fail-safe standstill monitor has detected the end of the run-on movement by means of two inductive proximity switches. When the button E is actuated, the coil of the solenoid interlock is energised.
- For suitable IFL range p-type inductive proximity switches, refer to „Schmersal Catalogue Automatisierungstechnik“.
- Feedback circuit
A feedback circuit to monitor external contactors can be connected to input X1.

Wiring diagram



ISD

The following faults are recognised by the safety monitoring module and indicated by the ISD

- Interruption of the connections to the inductive proximity switches
- Cross-wire monitoring
- Failure of proximity switches
- Failure of one channel being evaluated
- Failure of safety relay to pull-in or drop-out
- Faults on input or relay control circuits of the safety monitoring module

Note

The wiring diagram is shown with guard doors closed and in de-energised condition.

The ISD tables (Integral System Diagnostics) for analysis of the fault indications and their causes are shown in the appendix.

Standstill monitoring

FWS 3505






- Detects standstill using 2 impulse sensors
- Control Category 3 to EN 954-1
- 4 enabling paths
- Operating voltage 24 VDC
- Reset input
- 2 short-circuit proof additional transistor outputs
- 1 signalling contact
- ISD Integral System Diagnostics
- 2 channel microprocessor controlled
- Customer-specific standstill frequencies possible

Technical data

Standards:	EN 60204-1, EN 954-1, BG-GS-ET-20
Control category:	3
Start conditions:	Automatic
Enclosure:	glass-fibre reinforced thermoplastic
Mounting:	snaps onto standard DIN rail to EN 50022
Connection:	screw terminals
Cable section:	max. 4 mm ² (incl. conductor ferrules)
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
U _e :	24 VDC ± 15%
I _e :	0.3 A
Monitored inputs	2 channels, pulse generator p-type
Input resistance:	approx. 2 kΩ to ground
Input signal „1“:	10 ... 30 VDC
Input signal „0“:	0 ... 2 VDC
Max. cable length:	100 m of 0.75 mm ² conductor
Standstill frequency:	version C: input X2/X4: 1 Hz/1 Hz other versions: on request
Hysteresis:	10 % of standstill frequency
Max. input frequency:	1000 Hz
Min. pulse duration:	500 μs
Enabling contacts:	4 enabling paths
Utilisation category:	AC-15, DC-13
I _e /U _e :	3 A / 250 VAC 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 6 A (cos φ = 1)
Max. fuse rating:	6 A gG D-fuse
Signalling output:	2 transistor outputs, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof
Function display:	LED (ISD)
EMC rating:	conforming to EMC Directive
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Resistance to vibration:	10 ... 55 Hz / amplitude 0.35 mm
Resistance to shock:	30 g / 11 ms
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	- 25 °C ... + 70 °C
Dimensions:	100 x 75 x 110 mm
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Approvals



 in preparation



Ordering details

FWS 3505-2204 ①

No.	Replace	Description
-----	---------	-------------

①		24 VDC
---	--	--------

Function table

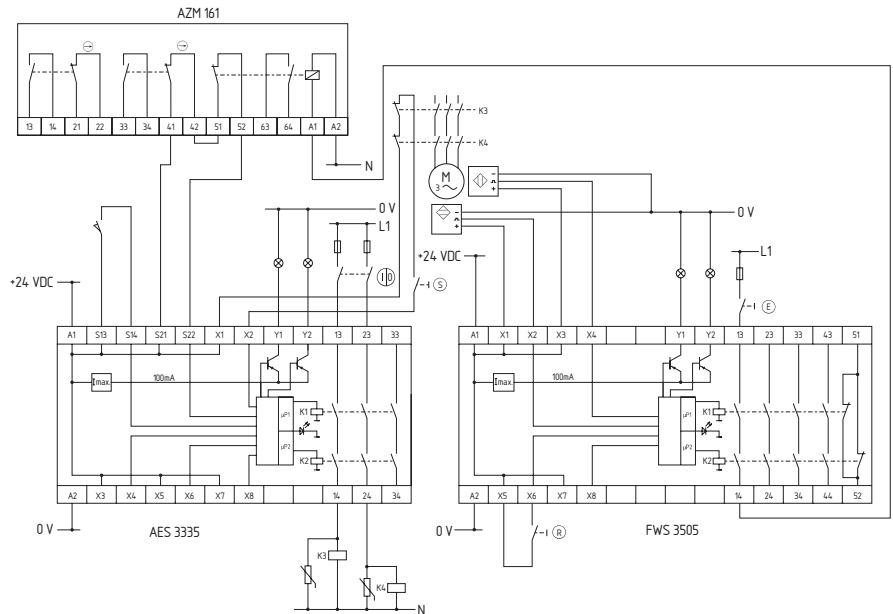
Additional transistor output:	Function:
Y1	Authorized operation, enabling paths closed
Y2	Fault

Standstill monitoring

Note

- FWS to monitor one guard door at plants with dangerous run-on movements up to control category 3 to EN 954-1
- Standstill monitoring for unlocking solenoid interlocks
- The solenoid interlock can be opened, when the standstill monitor has detected the end of the run-on movement by means of one or two inductive proximity switches. When the button (E) is actuated, the solenoid of the solenoid interlock is energised.
- If only one inductive proximity switch is connected to the standstill monitor, the standstill frequencies must be identical and inputs X2 and X4 must be bridged
- For suitable IFL range p-type inductive proximity switches, refer to „Schmersal Catalogue Automatisierungstechnik“.

Wiring diagram



ISD

The following faults are recognised by safety monitoring module and indicated by the ISD

- Interruption of the connections to the inductive proximity switches
- Failure of the proximity switches
- Failure of one channel being evaluated
- Failure of safety relay to pull-in or drop-out
- Faults on input or relay control circuits of the safety monitoring module

Note

The wiring diagram is shown with guard doors closed and in de-energised condition.

The ISD tables (Integral System Diagnostics) for analysis of the fault indications and their causes are shown in the appendix.

Fail-safe delay timer

AZS 2305



- Fail-safe delay time adjustable from 0.1 s to 99 min
- Control Category 3 to EN 954-1
- 3 enabling paths
- Recognition of cross-wire monitoring
- Available for various operating voltages
- 2 short-circuit proof additional transistor outputs
- ISD Integral System Diagnostics
- 2 channel microprocessor controlled

Technical data

Standards:	IEC/EN 60204-1, EN 954-1, BG-GS-ET-20
Control category:	3
Start conditions:	Automatic
Time range:	0.1 s ... 99 min
Enclosure:	glass-fibre reinforced thermoplastic
Mounting:	snaps onto standard DIN rail to EN 50022
Connection:	screw terminals
Cable section:	max. 4 mm ² (incl. conductor ferrules)
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
U _e :	AZS 2305: 24 VDC ± 15 % AZS 2305.1: 110 VAC AZS 2305.2: 230 VAC
I _e :	0.1 A at 24 VDC
Monitored inputs	1 NC / 1 NO
Input resistance:	approx. 2 kΩ to ground
Input signal „1“:	10 ... 30 VDC
Input signal „0“:	0 ... 2 VDC
Max. cable length:	1000 m of 0.75 mm ² conductor
Enabling contacts:	3 enabling paths
Utilisation category:	AC-15, DC-13
I _e /U _e :	2 A / 250 VAC 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 6 A (cos φ = 1)
Max. fuse rating:	6 A gG D-fuse
Signalling output:	2 transistor outputs, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof
t _{min} :	0.1 s
t _{max} :	99 min
Timing tolerance:	< 2 %
Function display:	LED (ISD)
EMC rating:	conforming to EMC Directive
Max. switching frequency:	10 Hz
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Resistance to vibration:	10 ... 55 Hz / amplitude 0.35 mm
Resistance to shock:	30 g / 11 ms
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	- 25 °C ... + 70 °C
Dimensions:	55 x 75 x 110 mm
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Approvals



Ordering details

AZS 2305.①

No.	Replace	Description
①		24 VDC
	1	110 VAC
	2	230 VAC

Function table

Additional transistor output: Function:

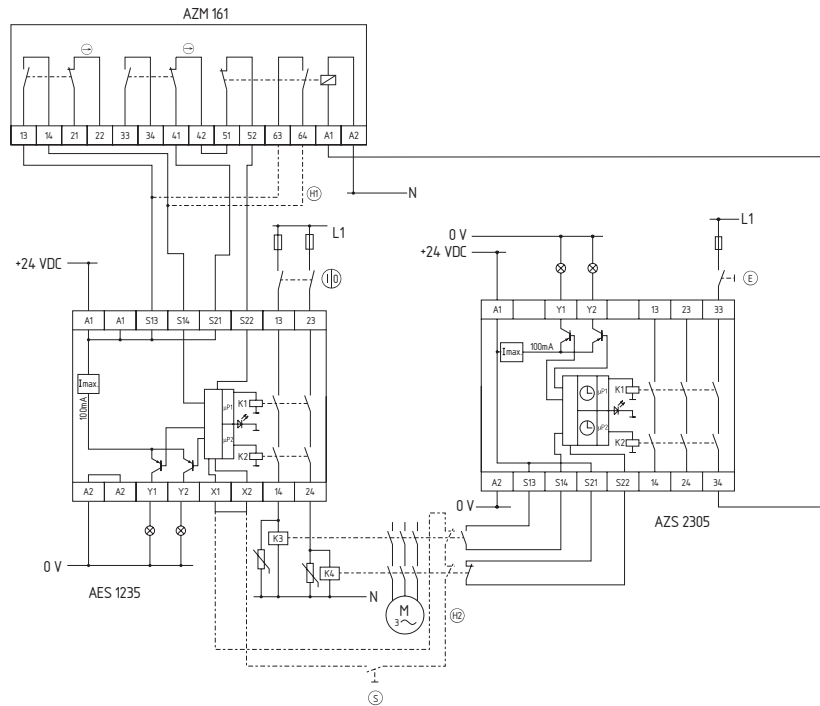
Y1	Authorized operation, enabling paths closed
Y2	No authorized operation, enabling paths open

Fail-safe delay timer

Note

- AZS for monitoring one safety guard in plants with dangerous run-on movements up to control category 3 to EN 954-1
- Monitoring time for unlocking of solenoid interlocks
- The solenoid interlock releases the guard device only when the set time has elapsed. The time begins to run when the power contactors have dropped out.

Wiring diagram



ISD

The following faults are recognised by the safety monitoring module and indicated by the ISD

- Failure of the internal safety relay to pull-in or drop-out
- Cross-wire monitoring
- Interruption of the input connections
- Difference in time setting between channel I and channel II
- Faults on input or relay control circuits of the safety monitoring module

Note

The wiring diagram is shown with guard doors closed and in de-energised condition.

The ISD tables (Integral System Diagnostics) for analysis of the fault indications and their causes are shown in the appendix.