SIEMENS

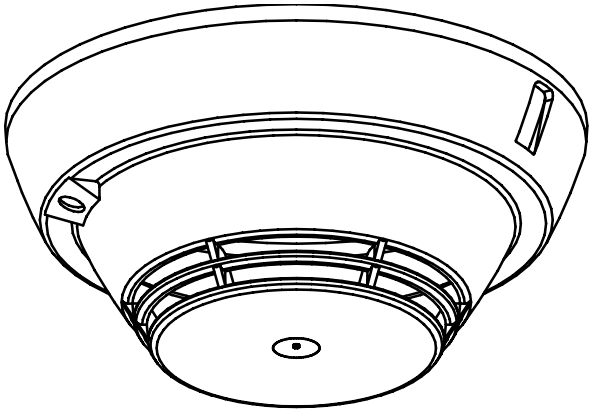
Synova™ Fire detection system
OP320A
Optical smoke detector

Technical description

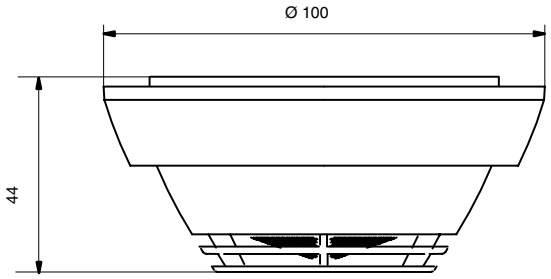
Building Technologies

Fire Safety & Security Products

1 General



Dimension



OP320A with base SO320

1.1 Characteristics

- **Multiple alarm levels**
  and fault and maintenance messages
- **Balanced response behaviour**
  and wide range of applications
- **Efficient signal processing**
  with two response sensitivities, selectable on the control unit
- **High-quality sensor system**
- **High contamination resistance**
  through appropriate design of the measurement chamber and the protective grille
- **Integrated multiple coincidence circuit**
  suppresses electrical and optical interference signals
- **State-of-the-art electronics**
  with custom integrated circuit (ASIC)
- **Monitored detector electronics**
  with transmission to the control unit
- **Comprehensive EMC concept based on the latest technology**
  allows the detector to be installed also in difficult environments
- **Disconnector functions in each detector**

1.2 Construction

The OP320A is installed in a modern, attractive, impact-resistant plastic housing that fits unobtrusively into any room architecture. The base does not contain any electronic components.

The detector is equipped with a response indicator (red LED) to indicate alarm. Each detector is equipped with a short-circuit proof output for connecting an external response indicator.

The detector is fully electronic and has no wearing parts. As protection against environmental influences the electronic circuitry is shielded and the circuit board is coated with a special protective varnish. For periodic factory overhaul the protective hood and grille can be removed.

The SO320 detector base can either be flush mounted directly on a recessed box in the ceiling, or surface mounted with the SOA322 base attachment. It is connected to the control unit via a two-wire detector bus. Spring terminals are provided for wiring the base.

Efficient testing of the detectors is possible by means of the RE6 testing unit. If an extension tube is used, work up to a ceiling height of 7m can be performed without any further tools. A comprehensive range of base accessories is available for special applications such as protection against unauthorized removal, etc.

2 Technical data

Normal ambient conditions, if nothing else is specified:
Temperature T_a = 20°C (293K)
Air pressure: p = 1'000hPa (1'000mbar)

Parameters	Symbol	Value				Conditions
		Unit	min.	typ.	max.	
Operating voltage	U_b	V	16.0		28.0	modulated
Operating current (quiescent condition)	I_b	µA			200	FET's closed
Baud rate		Bd		167		Duplex
Response sensitivity "Standard sensitivity" "increased sensitivity"	 D_1 D_1	 %/m %/m		 2.5 1.8		smoke sensitivity with paraffin test aerosol (1m/s)
Response integrating time «standard/increased sensitivity»	t_A	s		7		3 successive measurements
Response indicator: Flashing interval times: bright dark Response indicator current		 ms s mA		 32 1 15		
External response indicators		pieces			2	
Elektromagnetic compatibility		V/m	50			1MHz...1GHz
Operating temperature	T_a	°C	–10		+55	
Storage temperature	T_l	°C	–20		+65	
Humidity		%rH			≤95	no condensation
Connection factor	APMK			1		SynoLOOP

Colour: white ~RAL9010

Classification

Standards	EN 54-7	
Application category	IEC 60721-3:	3K5
Test category	IEC 60068-1:	10/055/21
Protection category	IEC 60529:	IP44
CE mark of conformity	yes	

Environmental compatibility:

– No basic throwaway items such as packing material, protective covers, etc.
– Multiway packing material
– Easy to overhaul
– Easy to uninstall and disassemble
– Halogenfree plastic material identifiable through embossed code

3 Design

The heart of the OP320A is a high-quality opto-electronic system enclosed in the measurement chamber that screens off extraneous light but optimally detects light and dark smoke particles. The light source, the light stop and the light receivers are arranged in such a way that the light from the source cannot directly reach the receiver (Fig. 1 and Fig. 2). Due to its optimized optical system and specially screened electronics the detector is highly immune to environmental influences such as temperature, humidity, corrosion and electrical stray fields.

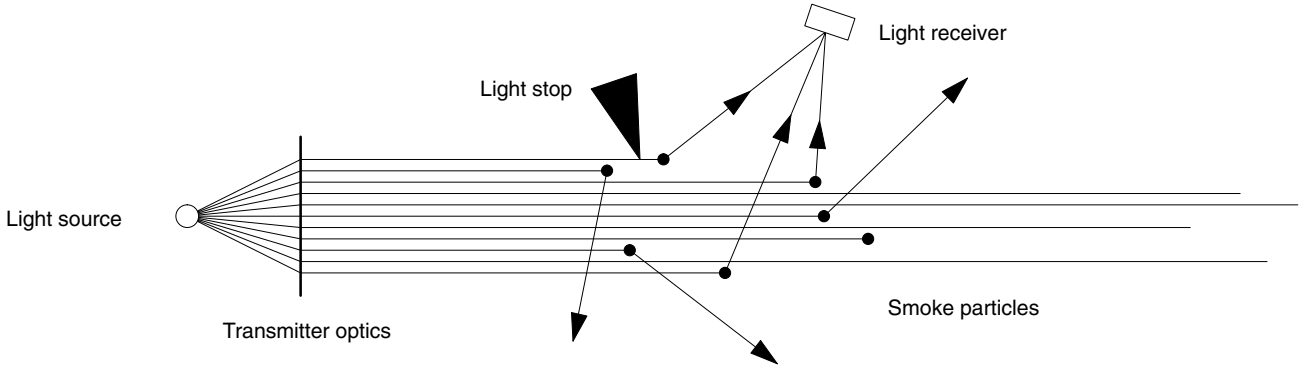
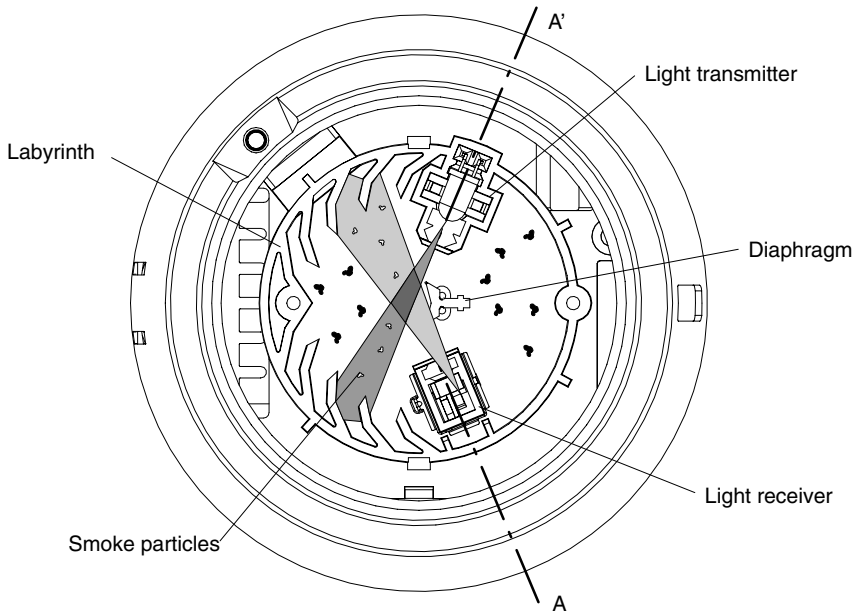


Fig. 1 Principle of the scattered light measurement



Sectional view A–A'

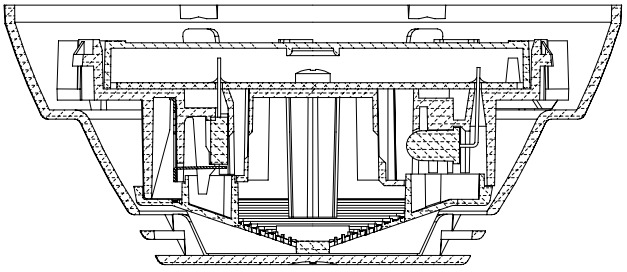


Fig. 2 Detector design

4 Emergency operation

If the OP320A can no longer be periodically addressed, for example due to a µP failure in the control unit, nevertheless an alarm is triggered by the evaluation electronics in the control unit interface.

5 Line disconnection function

If a short circuit occurs on the detector bus, total bus failure is prevented by disconnecting switches in each detector.

In the event of a short circuit the «electronic switches» (FET) open automatically and the short-circuited section between two detectors will be isolated. Because of this all detectors keep the full functioning.

The FET's reclose by acknowledging in the control unit when the short circuit is remedied.

6 Response characteristics

The extinction measurement principle is used for calibrating all types of optical smoke detectors. It measures the percentage of light obscuration (extinction) across a defined measuring section that is required to cause the detector to respond.

The light extinction by smoke is caused by absorption and scattering. In the case of dark smoke the absorption dominates, whereas in the case of light-colored smoke the scattering dominates. Since dark smoke produces a lower percentage of light scattering, scattered-light smoke detectors require a larger quantity of dark smoke to reach the alarm threshold than would be necessary for light-colored smoke. Due to the optimized scattering angle of the OP320A this disadvantage has been largely alleviated.

For evaluating the sensitivity of scattered-light smoke detectors, the extinction principle cannot be readily used. The characteristic of the smoke used in the measuring process must be clearly defined. In the case of the OP320A the smoke sensitivity is based on the measurement of defined paraffin test aerosol (Fig. 3, curve 1).

The internationally used unit of measure is dB/m. Measured in this unit the extinction as well as the scattered-light signal «S» are nearly proportional to the smoke density. If the smoke density is low, there is approximate proportionality between dB/m and %/m.

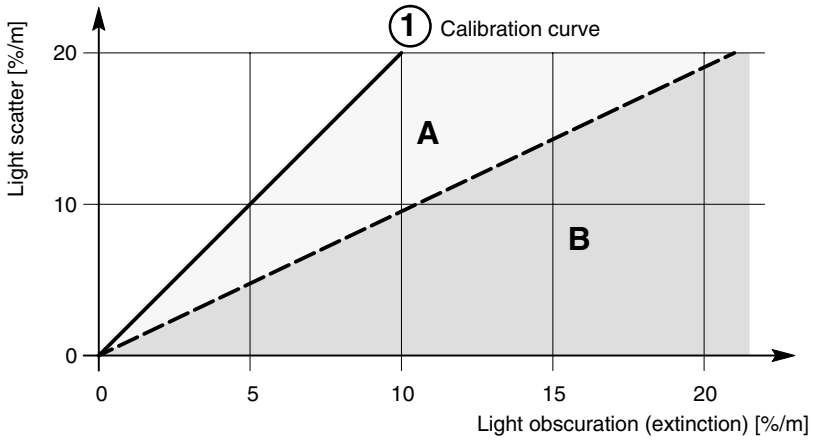


Fig. 3 Light scatter and light obscuration as a function of the smoke characteristic

The graphic representation in Fig. 3 shows the smoke sensitivity difference for the two measuring principles «Obscuration» and «Scatter» obtained with different test smokes or fires. We differentiate between two typical types of fires:

Range A: Smoldering fires

This type of fire is characterized by relatively low temperatures and light-colored smoke. Light-colored, large smoke particles are produced that contribute largely to the light scatter. Typical are: Smoldering wood or cotton, overheating of PVC-insulated electrical conductors, etc.

Range B: Flaming fires

These are generally characterized by elevated temperatures and by barely visible or dark smoke, depending on the material being combusted. Typical fires of this type are: Flaming wood fire, burning diesel fuel, plastic foam, rubber, etc.

7 Application

7.1 Compatibility

Fire detection system:	**Analog/addressable SynoLOOP system**
Control unit:	**FC330A / FC700A**
Base:	**SO320**

7.2 Adjustment functions

On the detector itself threre are no mechanical and electrical adjustments.

- If the detector has decided to «Alarm» due to several exceedings of the corresponding threshold, the signal will be forwarded to the control unit.
- The control unit evaluates as a default the detector signal «standard sensitive».
- Due to corresponding programming of the control unit the danger signal «increased sensitivity» can be evaluated.
- The self holding of the alarm signals is effected in the control unit until its resetting.

7.3 Application

Due to its EN54 compliance, the OP320A can be used as a universal smoke detector. The recommended monitoring surfaces, detector spacing, etc. can be found in the national guidelines, or the Security Guide.

7.4 Installation

- The installation is usually executed with twisted two-wire line from base to base.
- Parallel leaded lines and screened cabling from prevailing installations are also allowed.
- Loop and stub lines are admissible.
- Maximum 128 smoke detectors OP320A can be connected to a loop.

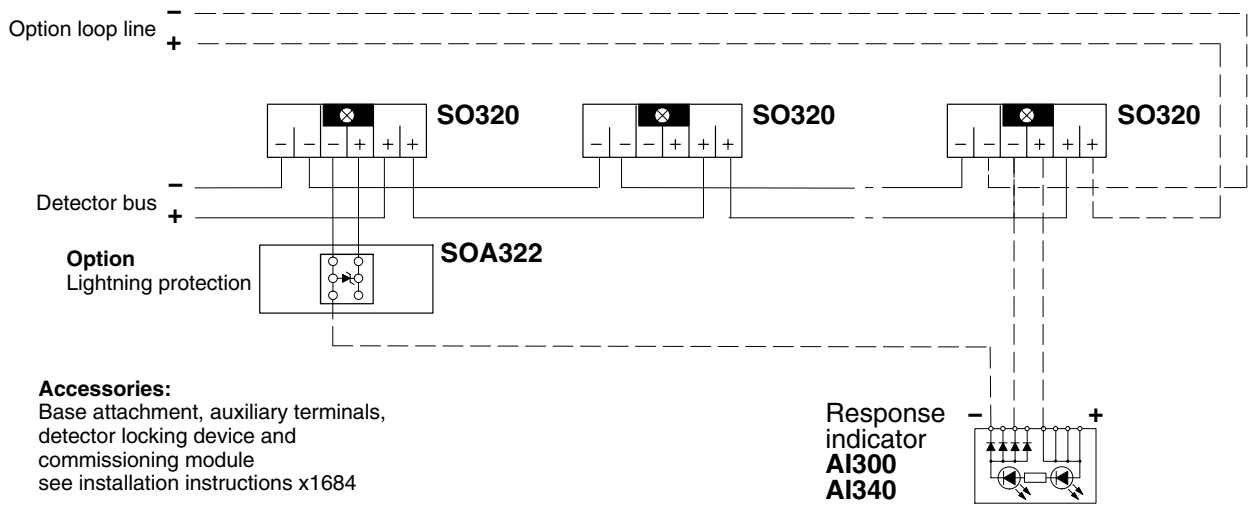


Fig. 4 Connection diagram

8 Commissioning

– To prevent unnecessary soiling during the construction phase, the detectors should be inserted into the bases just before the system is put into service.
– Each detector OP320A is connected in parallel to the two-wire detector bus. The address of the individual detectors is determined by the order in which the detectors are inserted or are checked with the detector tester.
– The line test set DZ1195 can be used for the final testing of installed detection lines.

9 Maintenance

9.1 Diagnostic possibilities

A detector OP320A can transmit 5 events to the control unit:
– Normal condition (quiescent value)
– Trouble (interference)
– Drift (lightly increased signal for maintenance purposes)
– Detector sensitivity increased (alarm at increased response sensitivity)
– Detector sensitivity standard (alarm at normal response sensitivity)

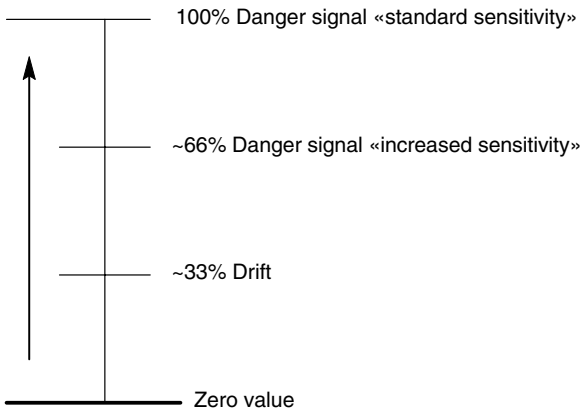


Fig. 5 Relationship Drift and danger signals standard / increased.

Drift:
– If a detector repeatedly emits the «Drift»-signal, this points to an environment which may not be suitable for this type of detector.
– Such applications must be evaluated more in details regarding choice of detector and the corrective steps which result from such evaluation must be taken.
– If a detector emits a constant «Drift»-signal, this hints at soiled detector optic.

Fault:
– If a detector responds with «Trouble» several times, the correct detector function is no longer ensured.
– Among the reasons are:
  – Line voltage at the detector location too low
  – Component failure in the detector etc.
– Such faults must be remedied forthwith!

9.2 Functional check / overhaul

Through the detector self-test the OP320A are subjected automatically to an extensive electrical function check. However, it is still necessary to conduct a physical function test on site in regular intervals.

A functional check of the detectors must be performed periodically by forcing each detector to respond by means of a suitable testing device (e.g. RE6). **Recommendation**: **Once a year,** unless otherwise specified by local regulations. Detectors that do not respond or which are mechanically damaged must be replaced.

All detectors should be replaced and factory overhauled in intervals of 2 to 9 years, depending on the environmental conditions and the severity of contamination. Consider possible national regulations.

If mechanically damaged detectors must be scrapped, the plastic materials can be sorted out based on the embossed code.

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