

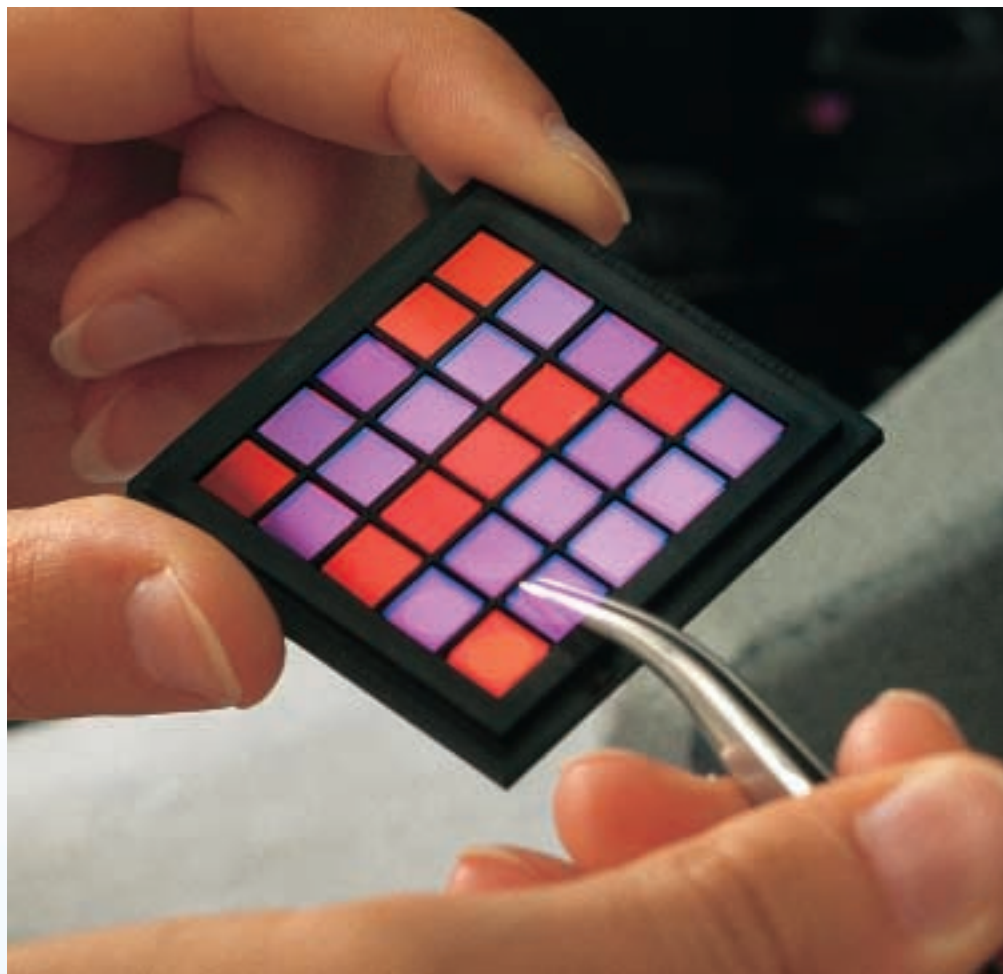
# SENSOR

A high tech sensor installed in a car activates windshield wipers when needed, offering additional riding comfort and improved safety. Coated optical filters from Schott are located inside the measuring system and provide accurate signal detection.

**B**ad weather in the summer or winter puts many drivers to the test: wet, snow-covered, icy or dirty roads not only increase the danger of sliding but also obstruct visibility. Be it rain, small hailstones or snow, water splashed onto the windshield by other cars can leave the driver with poor to no visibility for short periods. Turn the windshield wipers "on," turn the windshield wipers "off" again. The repetitive manual operation of windshield wiper intervals is a bothersome, distracting task which increases the risk of an accident. However, even under the most inclement weather conditions driving should be made as safe as possible. The automotive supply industry is meeting the challenge.

## Just in time

Engineers working in the Bosch research center recognized the problem many years ago and came up with an ingenious sensor. The function "rain = wipers on" would have been a relatively easy problem to solve from the technical standpoint. However, how could the windshield wiper system recognize and differentiate continuous rain from drizzle, snow from water splashed by other vehicles, night from the darkness of driving through tunnels? Would it react at the right time and with the needed frequency? The endless combinations of possible scenarios and the avoidance of incorrect responses demanded an advanced and intelligent technology. Bosch was able to solve the challenge by designing a complex optical system that incorporates a microprocessor. The Bosch rain sensor is installed on the windshield of the car near the rearview mirror.



*Better handling: The small, 6 x 6 mm filters are packaged in so-called "chip trays."*

## Close R + D cooperation with Schott

The programming of the processor requires high technical standards, as do the hardware and the precise functioning of the optical system. It is imperative that the optical system only reacts to the signal and not to scattered light or other external lights, which would distort the measurement and lead to incorrect outputs from the sensor. The elimination of such disruptive factors consists in filtering out all unneeded wavelengths. Engineers from Bosch and application experts from special glass manufacturer Schott tested numerous optical types of filters

for the rain sensor application. A special glass was melted and coated in order to meet the requirements. "An important added advantage offered by Schott was that we could supply both the material and the coating just in time," said Rüdiger Hentschel, head of Optic Filters in the optics business unit.

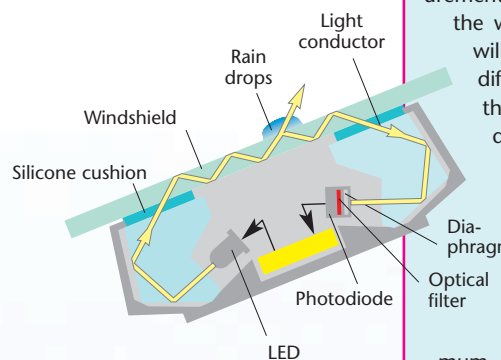
The Schott filter glass is manufactured as a block or rolled glass and then processed step by step into a one-millimeter thick polished filter glass.

# Improves Visibility

Then, the glass is coated with more than 60 compact and resistant oxidized layers. Afterwards, the filter glasses are cut to their final size of 6 x 6 millimeters using a special procedure. The mini-filters are then packaged in so-called chip trays, which hold 5 x 5 pieces. Quality control is fully automated. "Thanks to our glass and coating know-how we have been able to open up an interesting high tech application with the rain sensor," said Dr. Franz-Josef Urban, sales director of interference filters. "Regarding the cooperation with the automotive suppliers, market prospects couldn't be better."

The rain sensor has become a mass product since Peugeot first offered it as standard equipment in its 406 model in 1994. In the meantime, it is available in most of the other high-end Peugeot models. Every year, Bosch manufactures approximately one million of these rain

sensors. Future generations of the rain sensor will take on additional functions such as the control of headlights. Next to ABS, modern navigational systems and automatic transmission, the "rain sensor" presents an added, highly advanced safety feature. Soon, the conventional windshield wiper control may well become old hat ■

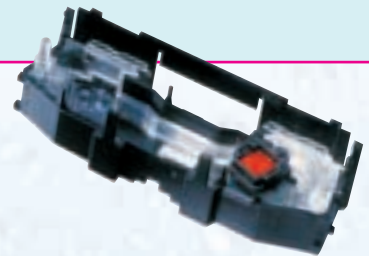


*The Bosch rain sensor is located near the rearview mirror.*

## Faster than the driver

The Bosch rain sensor works according to the following optical functional principle: A luminous diode (LED) emits light in the yellow spectral range. If the windshield is dry, all the light is transported along the windshield, which acts like an optical waveguide. Finally, the light is coupled out and measured with the help of a photodiode. If the windshield is wet or dirty, the measurement changes. The wetter or dirtier the windshield is, the less LED light will reach the diode. Using the difference in the incoming signals, the microprocessor calculates the quantity of water on the windshield and adjusts the speed of the windshield wiper system.

If torrential water covers the windshield completely (as often happens when passing a truck), the mechanism immediately switches to maximum wiping speed. A Schott filter embedded in the electronic system takes care to filter out all unneeded wavelengths so signals are accurately measured. The sensor reacts faster than the driver and allows both hands to stay on the steering wheel.



*Peugeot was one of the first automotive manufacturers to offer a rain sensor as standard equipment.*

