SPINDLE, a new type of differential-pressure flowmeter is described. The pressure drop is generated via the primary flow element, a spindle-shaped central body installed in the center of the pipe. Thus, an annular channel is formed between the central body and the housing. Numerical simulation indicates that, as the central body will modify the pipe flow into an annular channel flow, SPINDLE is able to condition the different flow characteristics upstream the meter, as present in industrial environments, into a very stable, repeatable and well characterized flow. Different from other primary flow elements, such as orifice plate, Venturi-cone etc, SPINDLE minimizes the drag of the central body as its shape has been optimized by genetic algorithms. As a result, no separation occurs, while keeping the differential pressure as high as possible. The streamlined shape also provides a self-cleaning function. The SPINDLE flow meter has been calibrated in different facilities, including the water calibration rig of NMI of China and the air calibration rig of Jiangsu Province Calibration Center. The calibration at PTB of Germany, with different piping configurations for flow disturbances according to OIML R 137, has verified the high performance of SPINDLE at configurations as typical for industry. The calibration results have shown that the SPINDLE flow meter exhibits a very constant dependence of discharge coefficient C on the Reynolds number Re for Re larger than 1 x 105. Uncertainties of 0.2 % in water and 0.5 % in air have been achieved because of the very stable flow and the very rigid structure of SPINDLE. The repeatability of the measurement of the flow rate is better than 0.05 % for water.