铁芯参数对磁通门输入输出特性影响分析

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摘　要：

针对磁通门需要什么参数的软磁铁芯的问题，在分析磁通门数学模型基础上，得出了正弦激励条件下磁通门的最佳激励磁场为铁芯饱和磁场强度的√2倍；以带磁滞的双曲正切函数拟合软磁材料磁滞回线，分析了饱和磁感应强度、饱和磁场强度、矫顽力、矩形比和退磁系数对输出二次谐波幅值和激励电流的影响，得出高灵敏度磁通门铁芯应具有高磁导率和矩形比，低饱和磁场强度、矫顽力和退磁系数；低功耗磁通门铁芯应具有高磁导率，适当的矩形比，低饱和磁感应强度、饱和磁场强度、矫顽力和退磁系数；最后通过对比两组六种不同铁芯的磁滞回线和双铁芯磁通门输入输出特性，验证了以上结论的正确性。

关键词：磁通门传感器；磁滞回线；软磁铁芯；最佳激励磁场；二次谐波幅值

Analysis of the Effect of Core Parameters on Input and Output Characteristics of the Fluxgate Sensor

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Abstract:

Aiming at the problem of what parameters of soft magnetic core needed by fluxgate sensor, based on the analysis of the mathematical model of fluxgate sensor, it is concluded that under the sine excitation, the optimum excitation magnetic field intensity of the fluxgate sensor is $\sqrt{2}$ times the saturated magnetic field intensity of the core. we used hyperbolic tangent function with hysteresis to fit the hysteresis loop of soft magnetic materials, analyzed the influence of saturated magnetic induction intensity, saturated magnetic field intensity, the coercive force, ratio of rectangular and demagnetizing factor on the second harmonic amplitude of induction coils and exciting current of fluxgate sensor, which reveal that the soft magnetic core of high sensitivity magnetic fluxgate sensor should have high permeability and rectangle ratio, low saturation magnetic field intensity, the coercive force and the demagnetizing factor. The soft magnetic core of low power fluxgate sensor should have high permeability, appropriate rectangle ratio, low saturated magnetic induction intensity, saturation magnetic field intensity, the coercive force and the demagnetizing factor. The comparison of the hysteresis loop of six different cores and their input and output characteristics in the dual core fluxgate, validated the correctness of the conclusions above.

Keywords: fluxgate sensor; hysteresis loop; soft magnetic core; optimum excitation magnetic field intensity; the secondary harmonic amplitude

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