Partial Regularity For
Anisotropic Functionals of Higher Order

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1 Introduction

Higher order variational functionals, emerging in the study of problems from materials science and engineering, have attracted a great deal of attention in last few years . In particular, the regularity of minimizers of such functionals has been studied very recently. The partial $C^{1,\alpha}$ regularity has been established for quasiconvex integrals with a p-power growth with respect to the gradient and for convex integrals having subquadratic nonstandard growth condition, only in dimension 2.

We present a partial regularity of minimizers of integral functionals of the type

$$I(u) = \int_\Omega f(D^k u(x))dx \tag{1}$$

where Ω is a bounded subset of $I\!R^n$, $u : \Omega \subset I\!R^n \to I\!R^N$, $N \geq 1$, $k > 1$ and f is a C^2 convex integrand satisfying the non standard growth condition:

$$C|\xi|^p \leq f(\xi) \leq L(1 + |\xi|^q) \tag{2}$$

with $p < q < p\frac{n}{n-1}$, without restriction on the dimension and on the order of derivatives involved, in the superquadratic case. The essential tool in our proof is a Lemma due to Fonseca and Maly which allows to connect in an annulus two functions $W^{k,p}$ with a function in $W^{k,q}$, for $p < q < p\frac{n}{n-1}$.