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DEVICES FOR EXTERNAL CONICAL SURFACES MEASUREMENTS

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***Abstract*—**The problem of machining and measuring conical surfaces with great accuracy is a challenging current subject in engineering. Cutting edge methods which measure the conicity and form errors of manufactured conical parts are accurate but involve high-costs equipments. New, accurate, practical and economical measuring instruments should be developed and to this end, the paper proposes some simple yet precise measuring devices. The paper presents the geometrical elements concerning a conical fitting that may be useful in designing and manufacturing diverse external taper measurements devices. The basic principles to be considered are determined and the minimum essential notions in designing the devices are presented. The calibrated rings method is considered and mechanical or digital callipers will be used in developing the devices.

Keywords — conical surfaces, taper, measurement, calliper, device

I. INTRODUCTION

THE problem of machining conical surfaces with great accuracy is a challenging current subject in engineering [1]. Modern techniques from various domains also require employment of adequate technologies in manufacturing precise conical mechanical parts [2], [3]. Up to date methods which measure the form errors of manufactured conical parts are accurate but involve high-costs equipments [4]-[6]. To be mentioned that in practical situation, not only very expensive methods and equipments, but techniques which use classical instruments can also provide reliable results with respect to the taper cone evaluation and measurement [7], [8]. A method based on a simple but realistic principle is proposed and the devices used for applying it are presented.

II. GENERAL ASPECTS UPON CONICAL FITTINGS PRECISION

Due to many advantages - precise centering, sealing opportunity, gap adjustment, the conical fittings are often used in machine building.

The main elements of a conical fitting are presented in Fig. 1, [9].

1) $\mathbf{d_M, d_m}$ *- the large and small diameters, respectively, of the conical shaft*
2) $\alpha/2$ *- angle between the generator and the axis;*
3) α *- cone angle, in axial section;*
4) $\mathbf{l_{23}}$ *- distance between two cross-sections of diameters* $\mathbf{d_2}$ *and* $\mathbf{d_3}$ *respectively;*
5) $\mathbf{l}$ *- distance between the reference surface for dimensioning and the nominal cross-section of diameter* $\mathbf{d_1}$ *- one of the frontal surfaces of the part or any other surface of functional significance can be chosen as reference surface;*
6) $\mathbf{L_B}$ *- basic distance of conical fitting, representing the distance, on axial direction, between two surfaces of the assembly,* $\mathbf{L'_B}$ *, or directly connected to the assembly,* $\mathbf{L''_B}$ *;*
7) $\mathbf{l_{d,D}}$ *- length of external/internal cone;*
8) $\mathbf{H}$ *- contact length between the two conical surfaces.*

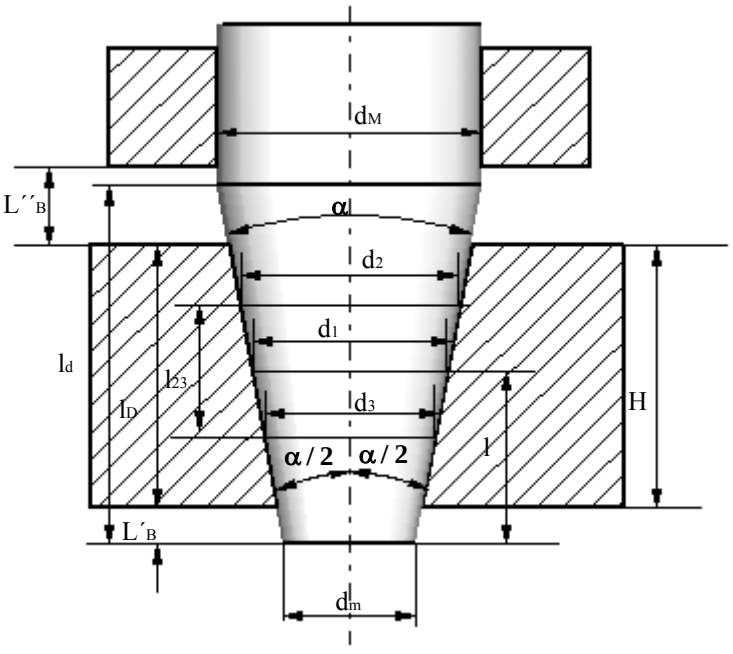

Fig. 1. Conical fitting