NOMENCLATURE for IPAR/IDIS - Dr. Eng. G. Castellani, Modena, Italy

Note: the symbols of ISO/R 701 are written with capital letters for the main symbols and small letters for the subscripts. Further symbols are added.

General data and thickness measurements (either direct or indirect):

A, A', A" : reference, operating or manufacturing center distance.
AkA, AkE, AkY : factors proportional to Almen factors for the extreme points of the contact path (A, E) or for a generic point Y.
Bu : net face width i.e. overlap face width.
Bw : width for the measurement of the base tangent length.
C1, C2 : clearance on the tooth tip of pinion and gear resp.
D, D' : reference and operating pitch diameters.
Da, Df : tip diameter, actual root diameter.
DaL : Limit contact diameter towards tooth tip. Can differ from Da for manufacturing as well as for meshing reasons (e.g.: semitopping, DaL=Dpa profil limit; meshing limit against undercut tooth, DaL=Dca).
Db : base diameter.
Dcf : extreme contact limit diameter towards tooth root. If DaL differs from Da in the mating gear: DcfL actual, Dcf theoretical contact limits.
Dpf : extreme diameter for correct profile meshing towards tooth root.
Dr : diameter of the circle that contains ball or roll centers.
Dw : diameter for the base tangent length (by symmetrical measurement).
Dy : diameter relating to a generic profile point.
DysN : diameter up to the normal chordal tooth thicknesses.
E-yN : chordal tooth space, normal to the local helices at a Dy diameter.
FY : ratio of the involute curvature radius at a point Y and the curvature radius at the pitch point, in a transverse plane.
Gy : length of the stretch of the contact path between the pitch point and a point Y relating to a diameter Dy .
H : actual tooth height.
Har : addendum of the reference rack.
Ha0 : tool addendum (nominal in the case of a pinion-cutter).
Ha0u : net hob addendum that generates involute.
Hpf0 : for semitopping: hob dedendum until chamfer.
H0 : for topping: height of the hob tooth.
Ibn, Ibn0 : reduction of the base normal thickness, resp. for ultimate teeth and for tool cut teeth (if Ibn0 < 0: thickness increase)
Jbn, Jr : base normal backlash, radial backlash.
K : coefficient = (X2±X1) - (A'-A)/Mn where -X1 is for internal gear pairs.
Ks, KsL : tip shortening coefficients, resp. for diameter Da and for diameter DaL .
M : measurement over rolls or balls.
Md : diametral equivalent of the measurement over rolls or balls - or measurement over rolls for involute worms.
Mn : normal reference module.
Mt, Mt' : transverse modules, reference and operating resp.
Pbn, Pbt : base pitch, normal and transverse resp.
Pn : normal reference pitch.
Pt, Pt' : transverse pitches, reference and operating resp.
Px : axial pitch.
ROa0 [ρa0]: rounding radius of the tool tip edge.

S2, S : sign (+1 o -1) of the larger gear of a gear pair and resp. sign of a generic gear.
SA, SE, SY : specific sliding in the extreme points of the contact path (A, E) or in generic point Y .
S-yN : chordal tooth thickness, normal to the local helices at a Dy diameter.
S-aN : the same as above for the tooth tip.
S-aNev, S-aNL : normal tip thickness resp. theoretical or at contact limit.
U : gear ratio (U = Z2/Z1 ≥ 1).
Us : shaving or grinding stock at every tooth flank.
U0 : protuberance amount at every tool tooth side.
V : tangential velocity.
VsA, VsE, VsY : sliding velocity in the extreme contact points or in Y.
Wn : normal base tangent length (Wildhaber measurement).
X : coefficient of the addendum modification. X > 0 if Df increases. According to DIN 3960: opposite sign for internal gears.
Xg0, Xg : generation addendum modific. coeff. (= f(X, Ibn0) or = f(X, Ibn)).
XA, XB , XD, XE, XY : for the typical meshing points and for a generic point Y, ratio of the local relative curvature radius of the mating involutes over the one relating to the pitch point, in a transverse plane.
Z : tooth number.
Zw : tooth number for the base tangent length (Wildhaber measurement).

α , αy : pressure angle, or the same at a profile point Y.
αn (alfan) : reference normal pressure angle.
αt, αt', αt" : transverse pressure angles: resp. reference, operating, cutting by pinion-cutter.
αu0 : hob protuberance, inclination of the rectilinear stretch.
β , β' : reference helix angle, operating helix angle.
βb : base helix angle.
εE1, εA2 : addendum contact ratios of pinion or gear resp.
εy : contact ratio from the pitch point up to a point at a diameter Dy. εy > 0 in addendum of the examined gear.
εα, εβ, εγ : (transverse or profile) contact ratio, face contact ratio (overlap ratio), total contact ratio.
τan : normal pressure angle at semitopping tooth chamfer.
τn : for semitopping: pressure angle of the hob chamfer.
ϕ (phi) : ball or roll diameter.

Subscripts:

1, 2; 0,G, S : pinion, gear (Z2 ≥ Z1); tool, Grinding, Shaving.
R : for teeth cut by Rack-cutter or hob or by a fictitious generating Rack.
n : relating to the normal section of the (real or fictitious) generating rack i.e. normal to the tooth reference helix.
N : normal to the local helices.
t : relating to the transverse section (normal to gear axis).
a : relating to tooth tip.
f : relating to tooth root.
y : relating to a generic diameter Dy at the tooth profile.

Further nomenclature for semitopping:

Dpa0, Dpa : limit diameters of the involute profile towards tooth tip, for tool cut teeth and for ultimate teeth respectively. The contact limit usually coincides: DaL = Dpa.
S-aN : real chordal thickness at the tooth tip, normal to the local helices.
S-paN0, S-paN : chordal normal thickness at chamfer beginning, resp. for tool cut teeth and for ultimate teeth.
SMR0, SMR : radial semitopping, resp. for cut and ultimate teeth.
SMTN0, SMTN : tangential semitopping, resp. for cut and ultimate teeth.

Grinding:

ROaG [ρaG] : rounding radius of the tip edge of the grinding wheel.
RfG0 : minimum distance between the gear axis and the tip of the grinding wheel (for Reishauer or Niles grinder types etc.)
Following parameters can equal or not equal the similar ones that relate to gear cutting i.e. «reference» parameters:
αnG : grinding normal pressure angle.
αG : grinding helix angle.
MnG : grinding normal module.
DG : gear pitch diameter at grinding.

Shaving. Data of the shaving cutter:

ZS : tooth number.
βS : helix angle.
DaS : tip diameter.
XS : addendum modification coefficient.
HaS : nominal reference addendum.
KsS : tip shortening coefficient: KsS = (Har - HaS) / Mn (which means addendum increasing if KsS < 0 ).

Tooth or tooth-space co-ordinates:

Rpf0, Rpf : radius at fillet/involute limit, for cut or ultimate teeth resp.
αty : in the transverse section, pressure angle of the involute profile at a Ry radius.
ν : angle that defines a point of the fillet, s.: G. Castellani & V. Parenti Castelli, Rating Gear Strength, ASME Trans., Journ. of Mech. Design, Apr.1981, Vol.103, p.516-527. NIlim [νlim]: fillet/involute limit.
Ry : radius from the centre of the gear section up to a point of the tooth profile (either root arc, or fillet, or involute, or «semitopping» chamfer if any).
Rys : radius at a chord: Rys = Ry - sagitta. For helical teeth, either in the transverse section, or chord normal to the local helices.
x, y : Cartesian co-ordinates of tooth or tooh-space profiles: x = S-y/2 (S-y/2 = semichord); y = Rys - Ra (Ra = tip radius), or y = Rf - Rys (Rf = root radius) as an option in the case of the tooth-space.