Propeller mass moment of inertia

1) General

To facilitate determination of the actual mass moment of inertia of a given propeller, the following diagram has been established covering typical propellers commonly used for ultralight aircraft (assuming they are applied according to their instructions of use).

2) Procedure

2.1) Propeller suspension

Fit a suitable symmetrical suspension fixture to the propeller hub (see illustration on page 2). It should be resistant but as light as possible in order not to falsify the value determined.

Suspend the propeller on 2 thin wires of 1830 mm (72 in.) length, in a symmetrical distance of 152,5 mm (6 in.) from the propeller hub center, as per illustration overleaf.

Measure the wire length of 1830 mm (72 in.) between the connection points. Take care the wires hang down parallelly. Chose a wire diameter as small as practicable to keep the torsional and bending resistance as low as possible. Respect the indicated wire length and distance with maximum accuracy.

2.2) Determination of time factor

Turn the suspended propeller in its horizontal axis by 5 - 10° and determine with a stop watch the time for 30 horizontal oscillation cycles.

ATTENTION: One cycle means a complete oscillation, forth and back, starting to count at "zero".

Clock the time for 30 oscillations exactly in seconds - this is an essential factor for determination of mass moment of inertia.

2.3) Determination of propeller weight:

Determine the total weight of propeller (as measured) in kg (lb.).

2.4) Determination of mass moment of inertia:

Mark the propeller weight on the diagram, connect it with the respective *"time line"* and read the mass moment of inertia (in $kgcm^2$ / $lb.in.^2$) vertically below the crossing point.

2.5) Example:

Propeller total weight: .....4,2 kg (9,3 lb.)
time for 30 oscillating cycles: .....175 sec.
resulting in mass moment of inertia: .....4500 $kgcm^2$ (1538 $lb.in.^2$)

BOMBARDIER - ROTAX
GESELLSCHAFT M.B.H. MOTORENFABRIK
A-4623 GUNSKIRCHEN—AUSTRIA
Telefon:..43-(0)7246-271-0*, Telefax:..43-(0)7246-370
Telex: 25546 brgk a, Telegr.: Bombrotax Gunskirchen

3) Admissible mass moment of inertia:

Depending on construction of the various propeller gearboxes offered by ROTAX, the maxadmissible mass moment of inertia of a propeller is for

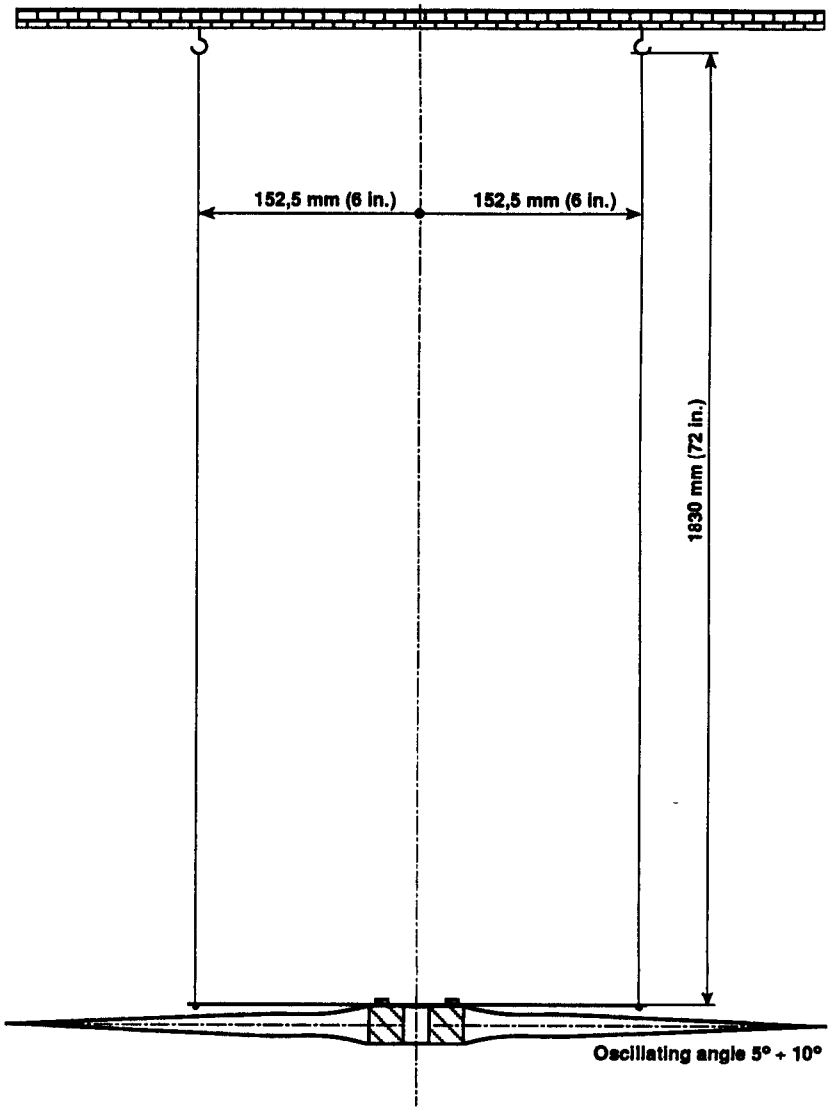
gearbox „A" and"B": ..... max. 3000 kgcm² (1025 lb.in.²)
gearbox „C": ..... max. 6000 kgcm² (2050 lb.in.²)
gearbox for engine type 912: ..... max. 6000 kgcm² (2050 lb.in.²)

4) Warranty:

Using propellers of a mass moment of inertia above the max. admissible values indicated by ROTAX means reduced life time or damage of the gearbox.

For such defects due to propellers of excessive mass moment of inertia BOMBARDER ROTAX refuses any claims for indemnity regarding product liability and warranty.

5) Test arrangement:



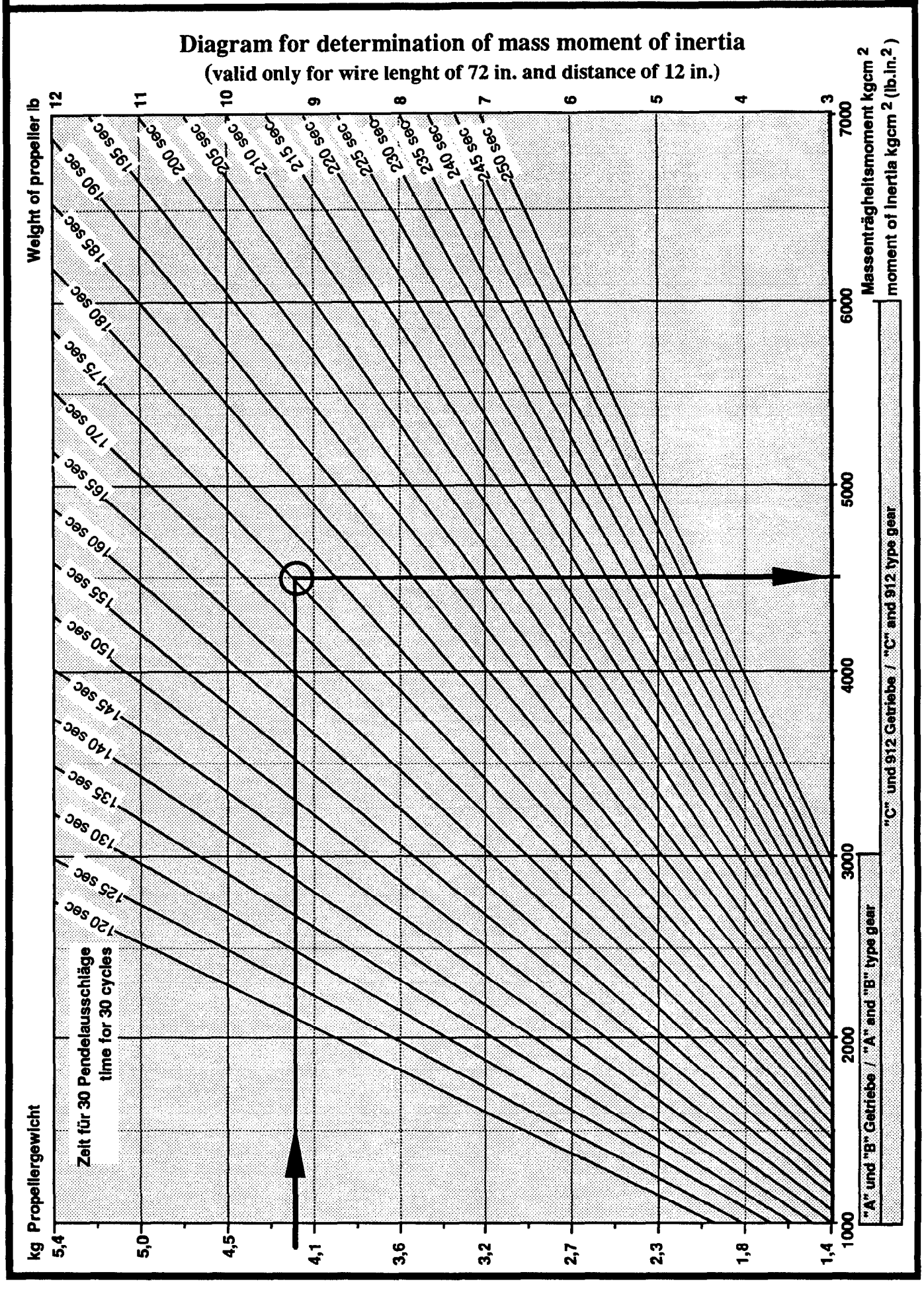


Diagram for determination of mass moment of inertia
(valid only for wire lenght of 72 in. and distance of 12 in.)
Weight of propeller lb
kg Propellergewicht
Zeit für 30 Pendelausschläge
time for 30 cycles
120 sec
125 sec
130 sec
135 sec
140 sec
145 sec
150 sec
155 sec
160 sec
165 sec
170 sec
175 sec
180 sec
185 sec
190 sec
195 sec
200 sec
205 sec
210 sec
215 sec
220 sec
225 sec
230 sec
235 sec
240 sec
245 sec
250 sec
Massenträgheitsmoment kgcm²
moment of inertia kgcm² (lb.in.²)
"A" und "B" Getriebe / "A" and "B" type gear
"C" und 912 Getriebe / "C" and 912 type gear