Definitions & Formulas

Tonnage

The force that the press is designed to exert against the work piece in the die. The tonnage rating is specified at a distance above the bottom of the stroke of the slide, which is the rated capacity of the machine. In most cases, mechanical non-geared presses of less than 45 tons capacity are rated at 1/32" (most commonly) to 1/16" (less frequently) from **BDC.** Geared presses of 45 tons and lesser capacity, if properly designed, should generally deliver full rated tonnage at 1/16" to 3/16" from **BDC.**

Note: Wintriss SmartPAC systems equipped with the Advanced WaveFormPAC load monitor can help you determine if your work is within the rated capacity of the machine. WaveFormPAC provides a **comparison of actual tonnage waveform to press capacity curve (user to input up to 15 values corresponding to press capacity at various distances off bottom as provided by the manufacturer).**

Energy

While work is being done on the work piece in the die, energy is required from the press. The flywheel of the press is a rotating body in which kinetic energy is accumulated and stored as it rotates during the non-working portion of each press stroke. The flywheel receives energy from the press motor. While work is being done during the working portion of a press stroke, the flywheel slows as it releases energy to do the work of metal forming in the die. This energy must be restored to the flywheel by the motor during the longer non-working portion of the press cycle. **Note: WaveFormPAC will also monitor motor slow down.**

Blanking Tonnage

DTC x T x 25 (for mild steel)

Blank Diameter x **it** x Thickness x 25

(Example: 6" dia.blank x .125 thick = 6 x 3.1416 x .125 x 25 = 59 tons)

Microns

1 micron = 1 millimeter divided by 1000 = .00004" 10 microns = .0004", etc.

Press Stroke/Shut Height

Shut height changes at a rate = 1/2 the stroke change (Example: 4" stroke, 12" shut height change to 6" stroke, shut height becomes 11")

Milliseconds

1 millisecond = 1 second divided by 1000 (Example: Related to a press running at 250 strokes per minute) 250 SPM divided by 60 (seconds) = 4.166 strokes per second. 1 divided by 4.166 = .240 (1 stroke in 240 milliseconds) 240 divided by 360 degrees = .666; therefore, the crank strokes .66 degrees per millisecond.

Metric Ton

Metric Ton = 1.1 US Ton

Slide Velocity

Stroke x pi x SPM divided by 12 = slide velocity at mid-stroke in feet per minute (Example 4" stroke x 3.1416 x 60 divided by 12 = 62 feet per minute.) This is about the maximum speed you can draw mild steel. Realize the slide velocity drops off considerably as you near bottom of the stroke. (Same ex.:54 FPM at 1", 48 FPM at 3/4", 42" at 1/2" and 30 FPM at 1/4".)Note: **WaveFormPAC also measures/displays slide speed**

Kilonewton

Kilonewton = 225 Lbs.

Millimeters to inches

multiply by .03937, or divide by 25.4

Kg/cm2 to PSI

multiply by 14.2

KW to HP

multiply by 1.25

Kilograms to pounds
multiply by 2.2

Safety Distance
Safety distance is the distance required for various types of presence sensing devices (most commonly, light curtains) or two hand controls to be effective. Safety distance defines the location the device must be located from the hazard such that hazardous motion is prevented, completed or stopped before the individual can reach the hazard. Refer to **OSHA 1910.217, ANSI B11.1-2009**, and/or **ANSI B11.19 for more details.**

The OSHA safety distance formula as specified in OSHA 1910.217 is

$$Ds = K \times Ts$$
where
Ds is the OSHA safety distance in inches
K is the OSHA-recommended hand-speed constant of 63 inches-per-second
Ts is the stopping time of the press in seconds measured at 90 degree position of the crankshaft.

ANSI formulas are more demanding and consider control response time, device response time, object sensitivity, and brake monitor safety factors.

$$Ds = K(Ts + Tc + Tr + Tspm) + Dpf$$

Ds is the OSHA safety distance in inches
K is the OSHA-recommended hand-speed constant of 63 inches-per-second
Ts is the stopping time of the press in seconds measured at 90 degree position of the crankshaft.
Tc is the clutch/brake control response time which may be included and displayed by some controls with integral stop time measurement capability.
Tr is the reaction time of the safety device.
Tspm is the allowed brake decay time established by the brake performance monitor.
Dpf is the depth of penetration allowed by the object sensitivity of the presence sensing device. This is usually provided by the manufacturer.