5 Trial : M10×1.5

If number of bolts is z, then for desired spacing

$5 \le 180\pi/10z \le 10 \Rightarrow 11 \ge z \ge 6$

try $z = 8$ bolts.

Proof load $F_p = A_s S_p = 58.0 \times 590 = 34$ kN

Initial load $0.75 \times 34 = 26 \le F_i \le 0.9 \times 34 = 30$ kN.

try $F_i = 28$ kN per bolt.

Consider stiffness of a single bolt & joint associated with one bolt.

BOLT exposed thread length $\sim 3p = 4$ mm

length of $\frac{1}{2}$ nut & head $\sim 0.5 \times 0.9 \times 10 = 4$ mm

shank $L = 50 - 4 + 4 = 50$ mm $A = \frac{\pi}{4} \times 10^2 = 78.5$ mm^2

threads $L = 4 + 4 = 8$ mm $A = A_s = 58.0$ mm^2

$\therefore 1/k_b = \Sigma L/AE = (50/78.5 + 8/58.0)/207$

$\therefore k_b = 267$ kN/mm.

JOINT for one "conical frustum", from (4)

$k_{j1} = 207 \times 10(0.102 + 0.654\frac{10}{25})/(1 - 0.12 \times \frac{10}{25})$

$= 2095$ kN/mm & $= k_{j2}$

$k_j = 1/\Sigma^1/k_{ji} = \frac{1}{2}$ of $2095 = \underline{1050}$ kN/mm

ASSEMBLY $k_e = 1/(1/267 + 1/1050) = \underline{213}$ kN/mm

Now consider external load on cover - pressure will extend outward to dia. of O-ring approximately. So, with a safety factor of 3 and eight bolts, the design external load per bolt assembly is

$P = 3 \times \frac{\pi}{4} \times 120^2 \times 6/8 = 25.5$ kN.

From (3) the design max. load / bolt is

$F_b = F_i + P\, k_e/k_j$

$= 28 + 25.5 \times 213/1050 = \underline{33.2}$ kN

Since this is less than F_p then trial is OK. But note the convergence of F_i ranging substantially !!

Other trial sizes might be undertaken but it is doubtful whether they'd be any better ($33.2 \approx 34$ kN).