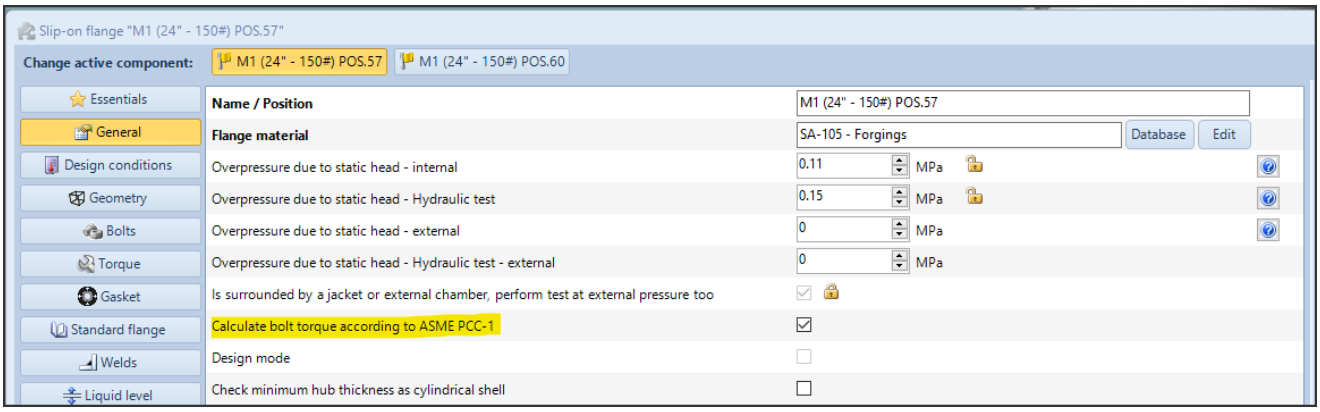
Bolt torque calculation for flanges

How to enable and manage the optional bolt torque calculation available for flanges.
Online version: https://nextgen.sant-ambrogio.it/KB811869
Latest update: 06 mag 2024

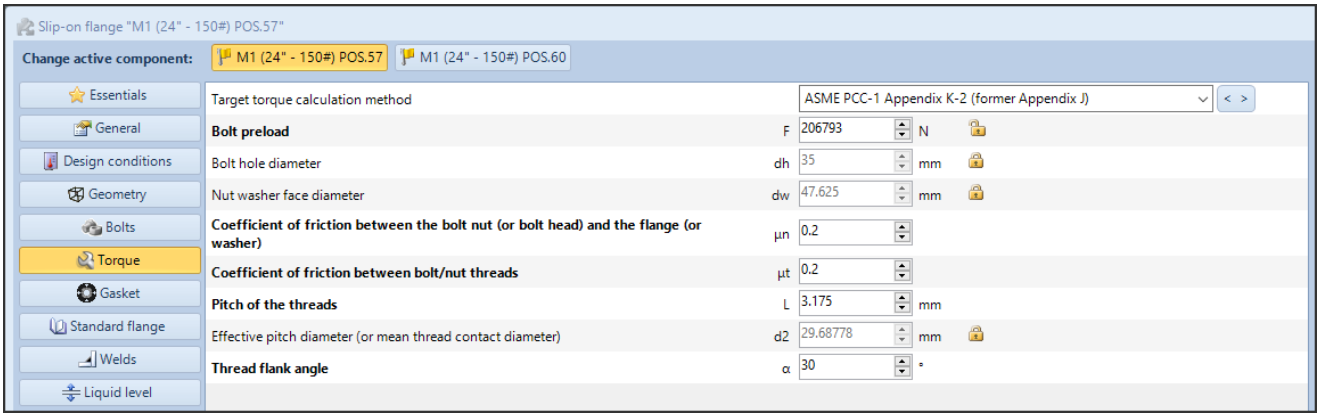
When designing a flange, it is possible to enable the calculation - which remains optional - of the tightening torque required for the bolts.

> *Regardless of the calculation code adopted, be it American or European, the methods for calculating the tightening torque are those of ASME PCC-1*

For flanges that support this calculation, simply enable it by checking the appropriate option in the "General" category of the component:



A new "Torque" category will then be displayed, in which to set the calculation method and its geometric and operational parameters:



The calculation report will finally show the procedure. This calculation does not require any validation and is available for both standard flanges and code-calculated flanges.

Standard Slip-on flange - M1 (24" - 150#) POS.57

According to: Asme VIII Div. 1 Ed. 2021, UG-44(a) - Metric Units

Flange material	**SA-105 - Forgings - UNS: K03504**
Shell material	**SA-240 - Plate - UNS: S31803**
Bolting material	**SA-193 B7 - Bolting (≤64) - UNS: G41400**
Gasket	**GOROTEX DF**

Calculation performed as a standard flange:			Yes
Flange standard / specification:			ASME B16.5 2013
Flange rating		=	150
Nominal size:			24"
Number of bolts		=	20
Bolt type:			ANSI_TEMA 1-1/4"
Material group		=	1.1
Calculation temperature	T	=	200.00 °C
Internal pressure	Pd	=	0.60 MPa
Overpressure due to static head	Ph	=	0.11 MPa
Calculation pressure	P	=	0.71 MPa
Maximum pressure at temperature allowed by the specifications	Pmax	=	1.38 MPa
			P ≤ Pmax (0.71 MPa ≤ 1.38 MPa): Ok

Bolt torque calculation according to ASME PCC-1 2022 Appendix K-2

Number of bolts	n	=	20
Target bolt tensile load	F	=	206 793 N
Bolt hole diameter	dh	=	35.00 mm
Nut washer face diameter	dw	=	47.63 mm
Effective bearing diameter of the nut face	De = (dh + dw) / 2	=	41.31 mm
Coefficient of friction between the bolt nut (or bolt head) and the flange (or washer)	μn	=	0.200
Coefficient of friction between bolt/nut threads	μt	=	0.200
Pitch of the threads	p	=	3.18 mm
Effective pitch diameter (or mean thread contact diameter)	d2	=	29.69 mm
Thread flank angle	β	=	30.00 °
Target torque	$T = \frac{F}{2}\left[\frac{p}{\pi} + \frac{\mu_t d_2}{\cos(\beta)} + D_e \mu_n\right]$	=	1 667.7 N·m
Tensile stress area of the thread (Appendix H)	As	=	645.2 mm²
Percentage utilization factor for material yield strength	P% = 100·F/(As·Sy)	=	44.21101 %