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## Layout

Input values:	1.234	or	1.234
Calculated values:	<b>1.234</b>	or	<b>1.234</b>
Critical values:	<b>1.234</b>	or	<b>1.234</b>
Estimated values:	<b>1.234</b>	or	<b>1.234</b>

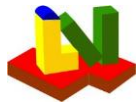


# ASME BPVC VIII-2 2025

PTB-3-2022 / E4.16.1

Strength Calculation Software	Program System ATLAS --- version : 11.0.8.24
Developed by Lauterbach Verfahrenstechnik GmbH	
Certified per DIN EN ISO 9001:2008	Certificate Number 01 100 044763

	LV Soft	ASME	Diff [%]
Example E4.16.1 - Integral Type			
Required load $W_0$	111.274,00 lbf	111282,70 lbf	0,01%
Moment $M_0$	206.529,00 in-lbf	206538,30 in-lbf	0,00%
Moment $M_g$	207.464,00 in-lbf	207923,00 in-lbf	0,22%



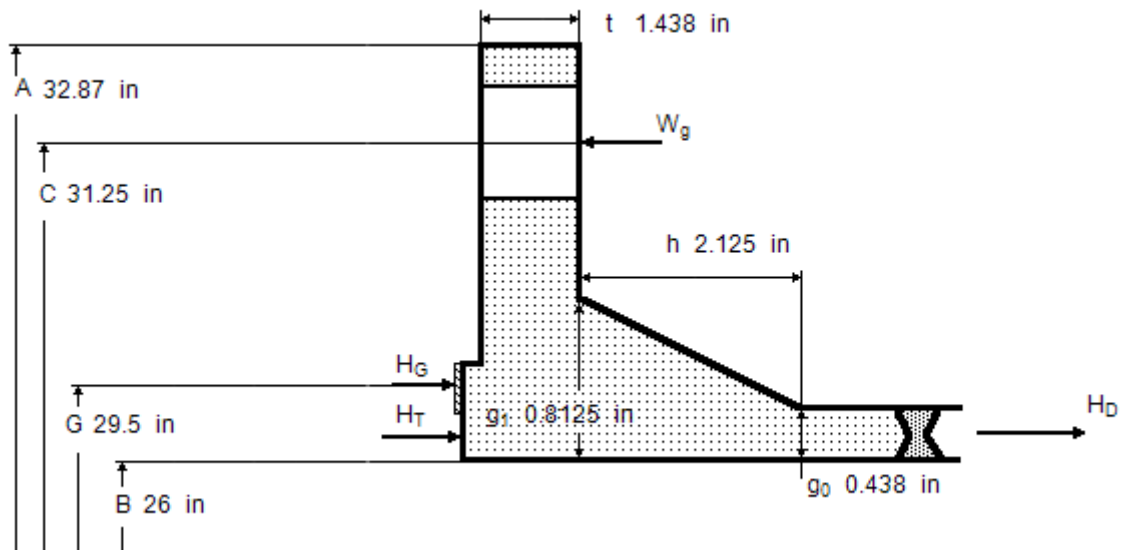
## E4.16.1 Flanges type integral acc. ASME BPVC VIII-2 Edition 2025

### Integral Type Flange

#### Design data

Design pressure	$P_D$	135 psi
Hydrostatic head	$D_P$	0 psi
Calculation pressure	$P_0$	<b>135</b> psi
Calculation temperature	$T_0$	650 °F

#### Flange

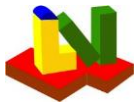


Outside diameter	A	32.87 in	Inside diameter	B	26 in
Bolt circle diameter	C	31.25 in	Pipe size	$B_n$	<b>26</b> in
Hub length	h	2.125 in	Flange thickness	t	1.438 in
Large hub thickness	$g_1$	0.8125 in	Small hub thick.	$g_0$	0.438 in

Thickness of semi-finished product	$t_0$	1.8 in
Material	K03504-SA-105	
Design strength operation	$S_{do}$	17811 psi
Design strength installation	$S_{da}$	23931 psi
Allowable operating stress	$S_{fb}$	<b>17811</b> psi
Allowable installation stress	$S_{fa}$	<b>23931</b> psi
Corrosion allowance	$c_2$	0.125 in
Modulus of elasticity at operation	$E_T$	2.591e+7 psi
Modulus of elasticity at test (20°C)	$E_{20}$	2.92e+7 psi

#### Gasket

Gasket diameter	G	29.5 in
Basic gasket seating width	N	0.5 in
Gasket width (Determine values from Table 4-16.3)	$b_0$	0.2031 in
Effective gasket width	b	<b>0.2031</b> in
Gasket factor	m	3.75
Gasket seating load	y	7600 psi

**ASME BPVC VIII-2 2025**

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**Bolts**

Number	n	44	
Root diameter	$d_K$	0.62 in	
Nominal diameter	a	0.75 in	
Material	G41400-SA-193-B7-Size:≤64		
Allowable operating stress	$S_{bo}$	24946 psi	
Allowable installation stress	$S_{bg}$	24946 psi	
Consider bolt spacing correction factor $B_{SC}$ ?	(N=No) N	(Y/N)	
Required operation bolt load	$W_o$	111274 lbf	
Minimum initial bolt load	$W_{gs}$	142981 lbf	
Available cross section of bolts	$A_b$	13.28 in <sup>2</sup>	
Required cross section	$A_{m1}$	4.46 in <sup>2</sup>	
Required cross section	$A_{m2}$	5.731 in <sup>2</sup>	
Minimum required cross section of bolt	$A_m = \text{Max.}(A_{m1}, A_{m2})$	5.731 in <sup>2</sup>	
Req. bolt load for gasket seating	$W_g$	237101 lbf	
Allowable bolt load	$W_{all}$	331221 lbf	
Design bolt force	EINBAUSCHRAUBENKRAFT		

**External forces and moments**

		<b>Operation</b>	
External axial force	$F_a$	0 lbf	
External moment	$M_E$	0 lbf·in	

**Moment**

	Force	·	Lever arm	=	Result
$M_D = H_D \cdot h_D$	= 73024 lbf	·	2.156 in	=	157459 lbf·in
$M_G = H_G \cdot h_G$	= 19049 lbf	·	0.875 in	=	16667 lbf·in
$M_T = H_T \cdot h_T$	= 19202 lbf	·	1.688 in	=	32403 lbf·in
Total operating moment	$M_o$	=		=	206529 lbf·in
Total gasket seating moment	$M_g$	=		=	207464 lbf·in
	$M_{oe}$	=		=	0 lbf·in

**Stress**

		Operation	Installation	≤ Allowable
Longitudinal	$S_H$	17775 psi	17855 psi	≤ 1.5 · $S_f$
Ratio	$S_H/S_f$	0.998	0.7461	≤ 1.5
Allowable stress	$S_f$	17811 psi	23931 psi	
Radial	$S_R$	6153 psi	6181 psi	≤ $S_f$
Tangential	$S_T$	5541 psi	5566 psi	≤ $S_f$
Combination	$(S_H+S_R)/2$	= 11964 psi	12018 psi	≤ $S_f$
Combination	$(S_H+S_T)/2$	= 11658 psi	11710 psi	≤ $S_f$
Bolt pitch	$B_S$	2.231 in	≤ 3.529 in	= $B_{Smax}$

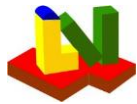
**Remark**

Cross-sectional area of bolts  
Strength condition flange

**Maximum allowable Working Pressure**

MAWP 9.744 bar

**Auxiliary values**



## ASME BPVC VIII-2 2025

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Rigidity criterion J  
operation: **0.8331**  $\leq 1.0$

KI (=0.3 acc. Table 4-  
16.10) = **0.3**

Rigidity criterion J  
assembly: **0.7428**  $\leq 1.0$

KI (=0.3 acc. Table 4-  
16.10) = **0.3**