	RMOWELL STRENGT		-	Jun. 9, 2016		REC.NO.
	E PTC 19.3 TW-2010					A-3 No welds (Lap-joint)
[PRO	OCESS CONDITION]					
(1)	図面番号					
(2)	Tag No.	Monju				
(3)	Operating temperature		°C	200		
(4)	Operating pressure	P kgf/cr		1.650		
(5)	Fluid density	γ kg	g/m^3 82	35.000		
(6)	Fluid viscosity	μ	cP	0.4000		
(7)	Flow rate	Q				
(8)	Pipe.inner dia.	D_D	mm			
(9)	Fluid velocity	V	m/s	5.00		
[TH	ERMOWELL SPECIF	TICATION]		Type of Thermowell :	B3 Notes 1:	Sign
(10)	Material		SUS304		Calcula	tion report \tilde{L} & Specification sheet U
(11)	Root out.dia.	A m	m 10.0		Notes 2:	Since calculation of a 2 ph
(12)	Tip out.dia.	B m	m 10.0			imes that it is a single phase nean density, please considered
(13)	Bore	d m	m 4.0			esult is an object for refere
(14)	Insertion length	L m			<i>b</i> mm 3.	
(15)	Actual insertion length	L_A m	m 150.5	(17) Tip thickness	<i>t</i> mm 3.	.0
[CA	LCULATION RESUL	T]				
[1]	Frequency Limit Calc.		ment: Pass*2	Reynolds No. Re		
	Strouhal frequency	55	Hz 94.3	30		
	Natural frequency	f_n^c	Hz 282.4			7.4 m/s
		0 4 00			$= 3295.1 > F_T$	$F_E S_f = 88.1 \text{ N/mn}$
	Frequency ratio	$f_s/f_n^c =$	0.334 < 0.4	Upper frequency ratio li	mit	
[2]	Steady-State Stress Ca	lc. Judger	ment: Pass]		
	Stress using the Von M		_	.30 < Allowable s	stress 1.5S N/m	m^2 144.00
[3]	Dynamic Stress Calc.	Judger		7		
5		0				
[3]				04 < Allowable stres	ss $F_T F_E S_f$ N/m	m ² 88.12
	Combind drag and lift	stresses Som	$_{ax}$ N/mm ² 17.	□ 04 < Allowable stres	ss $F_T F_E S_f$ N/m	m ² 88.12
		stresses S _{om}	nent: Pass)	m ² 88.12 35.91
	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i>	stresses S _{om} Judgen MPa 0	$\frac{17}{ment} = \frac{N}{ment} = \frac{Pass}{16}$	☐ .04 < Allowable stres] al pressure rating for tip sh al pressure rating for the tij	nank P_c MPa	
[4]	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i>	stresses S _{om} Judgen MPa 0	$\frac{17}{ment} = \frac{N}{ment} = \frac{Pass}{16}$	al pressure rating for tip shal pressure rating for the tip	$pank P_c MPa$ $p P_t MPa$	35.91 415.38
[4] [RE	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS]	stresses S _{om} Judgen MPa 0. MPa 0.	$\begin{array}{rcrc} & \text{N/mm}^2 & 17, \\ \hline ment: & Pass \\ \hline 16 &< & \text{Externation} \\ 16 &< & \text{Externation} \\ \hline \end{array}$	al pressure rating for tip shal pressure rating for the tip Strouhal No.	nank P_c MPa p P_t MPa N_s	35.91 415.38 0.19
[4] [RE Fa	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit	stresses S _{om} Judgen MPa 0 MPa 0. S _f N/	$\frac{1}{16} \times \frac{N}{mm^2} = \frac{17}{17}$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor	$\begin{array}{c} \text{nank } P_c \text{MPa} \\ p P_t \text{MPa} \\ \hline N_s \\ \zeta \end{array}$	35.91 415.38 0.19 0.0005
[4] [RE Fa	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress	stresses S_{om} Judgen MPa 0. MPa 0. S_f N/ S N/	$mm^{2} N/mm^{2} 17$ $ment: Pass$ $16 < Externation (16) < Externation (16) < Externation (16) < mm^{2} 93.8$ $mm^{2} 96.0$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration t	$\begin{array}{ccc} \text{nank } P_c & \text{MPa} \\ p & P_t & \text{MPa} \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & $	35.91 415.38 0.19 0.0005 1.2
[4] [RE Fa A Sa	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress ensor average density	stresses S_{om} Judgen MPa 0. MPa 0. S_f N/ S N/ γ_s kg	$mm^{2} N/mm^{2} 17$ $ment: Pass$ $16 < Externation (16) < Externatio$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient	$\begin{array}{ccc} \text{mank } P_c & \text{MPa} \\ \text{p} & P_t & \text{MPa} \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\ & & \\$	35.91 415.38 0.19 0.0005 1.2 1.40
[4] [RE Fa A So Y	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress ensor average density oung's modulus	stresses S_{om} Judgen MPa 0. MPa 0. S_f N/ S N/ γ_s kg E N/	$\frac{1}{10000000000000000000000000000000000$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coeffi	$\begin{array}{ccc} \text{nank } P_c & \text{MPa} \\ p & P_t & \text{MPa} \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & & & \\ & $	35.91 415.38 0.19 0.0005 1.2 1.40 0.10
[4] [RE Fa Sa Y D	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress ensor average density oung's modulus pensity of thermowell	stresses S_{om} \boxed{Judgen} MPa 0. MPa 0. S_f N/ S N/ γ_s kg E N/ γ_m kg	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externation mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2700$ $mm^{2} 183 036$ $g/m^{3} 7 980$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coefficient	$\begin{array}{ccc} \text{nank } P_c & \text{MPa} \\ p & P_t & \text{MPa} \\ & & \zeta \\ factor & K_t \\ & & C_D \\ ficient & C_d \\ cient & C_l \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00
[4] [RE Fa A Sa Y D	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress ensor average density oung's modulus ensity of thermowell culation Method : ASM	stresses S_{om} \boxed{Judgen} MPa 0. MPa 0. S_f N/ S N/ γ_s kg E N/ γ_m kg	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externation mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2700$ $mm^{2} 183 036$ $g/m^{3} 7 980$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coeffi	$\begin{array}{ccc} \text{nank } P_c & \text{MPa} \\ p & P_t & \text{MPa} \\ & & \zeta \\ factor & K_t \\ & & C_D \\ ficient & C_d \\ cient & C_l \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10
[4] [RE Fa Sa Y D [Cal [1] Fi	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress ensor average density oung's modulus ensity of thermowell culation Method : ASM requency Limit Calc.	stresses S_{om} Judgen MPa 0. MPa 0. S_f N/ S N/ γ_s kg E N/1 γ_m kg IE PTC 19.3	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externation:$ $mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2 700$ $mm^{2} 183 036$ $g/m^{3} 7 980$ $B TW-2010]$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coefficient	$\begin{array}{ccc} \text{nank } P_c & \text{MPa} \\ p & P_t & \text{MPa} \\ & & \zeta \\ factor & K_t \\ & & C_D \\ ficient & C_d \\ cient & C_l \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00
[4] [RE Fa Sa Y D [Cal [1] Fi	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress ensor average density oung's modulus ensity of thermowell culation Method : ASM	stresses S_{om} \boxed{Judgen} MPa 0. MPa 0. $S_f N/$ S N/ $\gamma_s kg$ E N/n $\gamma_m kg$ IE PTC 19.3 $f = St \frac{V}{2}$	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externations$ $mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2 700$ $mm^{2} 183 036$ $g/m^{3} 7 980$ $B TW-2010$ $mm^{2} 10^{3}$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coeffi Magnification factor	$\begin{array}{c} \text{nank } P_c \text{MPa} \\ p P_t \text{MPa} \\ \hline \\ & \zeta \\ factor K_t \\ C_D \\ ficient C_d \\ cient C_l \\ (V_{IR}) F'_{Mmax} \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00 1000.0
[4] [RE Fa Sa Y D [Cal [1] Fi Sa	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress ensor average density foung's modulus bensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency	stresses S_{om} \boxed{Judgen} MPa 0. MPa 0. $S_f N/$ S N/ $\gamma_s kg$ E N/n $\gamma_m kg$ IE PTC 19.3 $f = St \frac{V}{2}$	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externations$ $mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2 700$ $mm^{2} 183 036$ $g/m^{3} 7 980$ $B TW-2010$ $mm^{2} 10^{3}$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coeffi Magnification factor	$\begin{array}{c} \text{nank } P_c \text{MPa} \\ p P_t \text{MPa} \\ \hline \\ & \zeta \\ factor K_t \\ C_D \\ ficient C_d \\ cient C_l \\ (V_{IR}) F'_{Mmax} \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00 1000.0
[4] [RE Fa Sa Y D [Cal [1] Fa Sa N	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress ensor average density oung's modulus pensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency Vatural Frequency	stresses S_{om} \boxed{Judgen} MPa 0. MPa 0. $S_f N/$ S N/ $\gamma_s kg$ E N/n $\gamma_m kg$ IE PTC 19.3 $f = St \frac{V}{2}$	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externations$ $mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2 700$ $mm^{2} 183 036$ $g/m^{3} 7 980$ $B TW-2010$ $mm^{2} 10^{3}$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coeffi Magnification factor	$\begin{array}{c} \text{nank } P_c \text{MPa} \\ p P_t \text{MPa} \\ \hline \\ & \zeta \\ \text{factor} K_t \\ C_D \\ \text{ficient} C_d \\ \text{cient} C_l \\ (V_{IR}) F'_{Mmax} \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00 1000.0
[4] [RE Fa A Sa Y D [Cal [1] Fi Si N S	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress ensor average density oung's modulus ensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency latural Frequency cruton No.	stresses S_{om} \boxed{Judgen} MPa 0. MPa 0. $S_f N/$ S N/ $\gamma_s kg$ E N/n $\gamma_m kg$ IE PTC 19.3 $f = St \frac{V}{2}$	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externations$ $mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2 700$ $mm^{2} 183 036$ $g/m^{3} 7 980$ $B TW-2010$ $mm^{2} 10^{3}$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coeffi Magnification factor	$\begin{array}{c} \text{nank } P_c \text{MPa} \\ p P_t \text{MPa} \\ \hline \\ & \zeta \\ \text{factor} K_t \\ C_D \\ \text{ficient} C_d \\ \text{cient} C_l \\ (V_{IR}) F'_{Mmax} \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00 1000.0
[4] [RE Fa A Sa Y D [Cal [1] Fi Si N S	Combind drag and lift Pressure Stress Calc. Operating pressure <i>P</i> Operating pressure <i>P</i> MARKS] atigue endurance limit llowable stress ensor average density oung's modulus ensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency latural Frequency cruton No. Cyclic stress at the <i>V</i> _{IR}	stresses S_{om} \boxed{Judgen} MPa 0. MPa 0. $S_f N/$ S N/ $\gamma_s kg$ E N/n $\gamma_m kg$ IE PTC 19.3 $f = St \frac{V}{2}$	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externations$ $mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2 700$ $mm^{2} 183 036$ $g/m^{3} 7 980$ $B TW-2010$ $mm^{2} 10^{3}$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coeffi Magnification factor	$\begin{array}{c} \text{nank } P_c \text{MPa} \\ p P_t \text{MPa} \\ \hline \\ & \zeta \\ \text{factor} K_t \\ C_D \\ \text{ficient} C_d \\ \text{cient} C_l \\ (V_{IR}) F'_{Mmax} \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00 1000.0
[4] [RE Fi A So Y D [Cal [1] Fi Si N S C	Combind drag and lift Pressure Stress Calc. Operating pressure P Operating pressure P MARKS] atigue endurance limit llowable stress ensor average density oung's modulus ensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency latural Frequency cruton No. cyclic stress at the V_{IR} $(S_L=0)$	stresses S_{om} \boxed{Judgen} MPa 0. MPa 0. $S_f N/$ S N/ $\gamma_s kg$ E N/n $\gamma_m kg$ IE PTC 19.3 $f = St \frac{V}{2}$	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externations$ $mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2 700$ $mm^{2} 183 036$ $g/m^{3} 7 980$ $B TW-2010$ $mm^{2} 10^{3}$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coeffi Magnification factor	$\begin{array}{c} \text{nank } P_c \text{MPa} \\ p P_t \text{MPa} \\ \hline \\ & \zeta \\ \text{factor} K_t \\ C_D \\ \text{ficient} C_d \\ \text{cient} C_l \\ (V_{IR}) F'_{Mmax} \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00 1000.0
[4] [RE Fa Sa Y D [Cal [1] Fi Si N S S C C In	Combind drag and lift Pressure Stress Calc. Operating pressure P Operating pressure P MARKS] atigue endurance limit llowable stress ensor average density oung's modulus ensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency latural Frequency cruton No. Syclic stress at the V_{IR} $(S_L=0)$ hline resonance velocity	stresses S_{om} \boxed{Judgen} MPa 0. MPa 0. $S_f N/$ S N/ $\gamma_s kg$ E N/n $\gamma_m kg$ IE PTC 19.3 $f = St \frac{V}{2}$	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externation:$ $mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2 700$ $mm^{2} 183 036$ $g/m^{3} 7 980$ $B TW-2010$ $mm^{2} 10^{3}$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coeffi Magnification factor	$\begin{array}{c} \text{nank } P_c \text{MPa} \\ p P_t \text{MPa} \\ \hline \\ & \zeta \\ \text{factor} K_t \\ C_D \\ \text{ficient} C_d \\ \text{cient} C_l \\ (V_{IR}) F'_{Mmax} \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00 1000.0
[4] [RE Fa A Sa Y D [Cal [1] Fa Sa N S C C In [2] S	Combind drag and lift Pressure Stress Calc. Operating pressure P Operating pressure P MARKS] atigue endurance limit llowable stress ensor average density oung's modulus rensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency latural Frequency cruton No. Syclic stress at the V_{IR} $(S_L=0)$ nline resonance velocity teady-State Stress Calc.	stresses S_{om} \boxed{Judgen} MPa 0. MPa 0. $S_f N/$ S N/ $\gamma_s kg$ E N/n $\gamma_m kg$ IE PTC 19.3 $f = St \frac{V}{2}$	$mm^{2} N/mm^{2} 17.$ $ment: Pass$ $16 < Externation:$ $mm^{2} 93.8$ $mm^{2} 96.0$ $g/m^{3} 2 700$ $mm^{2} 183 036$ $g/m^{3} 7 980$ $B TW-2010$ $mm^{2} 10^{3}$	al pressure rating for tip sh al pressure rating for the tip Strouhal No. Damping factor Stress concentration f Drag coefficient Oscillating-drag coeffi Magnification factor	$\begin{array}{c} \text{nank } P_c \text{MPa} \\ p P_t \text{MPa} \\ \hline \\ & \zeta \\ \text{factor} K_t \\ C_D \\ \text{ficient} C_d \\ \text{cient} C_l \\ (V_{IR}) F'_{Mmax} \end{array}$	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00 1000.0
[4] [RE Fa A Sa Y D [Cal [1] Fa Sa Sa C C In [2] S	Combind drag and lift Pressure Stress Calc. Operating pressure P Operating pressure P MARKS] atigue endurance limit llowable stress ensor average density oung's modulus ensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency latural Frequency cruton No. Syclic stress at the V_{IR} $(S_L=0)$ hline resonance velocity	stresses S_{oma} \boxed{Judgen} MPa 0. MPa 0. MPa 0. $S_f N/$ S N/ $\gamma_s kg$ E N/ $\gamma_m kg$ IE PTC 19.3 $f_s = St \frac{V}{D}$ $f_n^c = H_c f_n$ $N_{Sc} = \pi^2 \zeta$ ($S_{omax} = K_t$) V_{IR} at the V $\sqrt{\frac{\zeta}{L}}$	$\frac{1}{2} \frac{N/mm^2}{17} \frac{17}{17}$ $\frac{1}{2} \frac{1}{16} < \frac{Pass}{16} < \frac{Pass}{16} < \frac{1}{16} < \frac{Pass}{16} < \frac{1}{16} < $	al pressure rating for tip shal pressure rating for the tip Strouhal No. Damping factor Stress concentration for Drag coefficient Oscillating-drag coeffic Oscillating-lift coeffic Magnification factor of $f_n = H_f H_{af} H_{as} f_a$ Reynolds No. $Re =$ $S_d = G_{SP} F'_{Mmax} P_d$ $G_{SP} = \frac{16L^2}{3\pi A^2 [1 - (d/A)^4]}$ $\overline{S_s} = 1.5S$	hank P_c MPa $p = P_t$ MPa N_S ζ factor K_t C_D ficient C_d cient C_l (V_{IR}) F'_{Mmax} $f_a = \frac{\lambda^2}{2\pi}$ $f_a = \frac{1}{2}\gamma C_d V_{IR}^2 \cdot I_d$ $\{3[1 - (L_0/L)^2] + 2(B_d)$ $d = G_{SP} P_D$ $P_D =$	$35.91 \\ 415.38 \\ 0.19 \\ 0.0005 \\ 1.2 \\ 1.40 \\ 0.10 \\ 1.00 \\ 1000.0 \\ \frac{2}{L^2} \sqrt{\frac{E I}{m} 10^{12}} \\ 0^6 \text{ N/mm}^2 \\ \frac{8}{A-1} [1 - (L_0/L)^3] \\ L_0 = L - L_A \\ = \frac{1}{2} \gamma C_D V^2 \cdot 10^6 $
[4] [RE Fa A So Y D [Cal [1] Fi Si N S C C In [2] S V (3] [Combind drag and lift Pressure Stress Calc. Operating pressure P Operating pressure P MARKS] atigue endurance limit llowable stress ensor average density oung's modulus rensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency latural Frequency cruton No. Syclic stress at the V_{IR} $(S_L=0)$ nline resonance velocity teady-State Stress Calc.	stresses S_{oma} \boxed{Judgen} MPa 0. MPa 0. MPa 0. $S_f N/$ S N/ $\gamma_s kg$ E N/ $\gamma_m kg$ IE PTC 19.3 $f_s = St \frac{V}{D}$ $f_n^c = H_c f_n$ $N_{Sc} = \pi^2 \zeta$ ($S_{omax} = K_t$) V_{IR} at the V $\sqrt{\frac{\zeta}{L}}$	$\frac{1}{2} \frac{N/mm^2}{17} \frac{17}{17}$ $\frac{1}{2} \frac{1}{16} < \frac{Pass}{16} < \frac{Pass}{16} < \frac{1}{16} < \frac{Pass}{16} < \frac{1}{16} < $	al pressure rating for tip shal pressure rating for the tip Strouhal No. Damping factor Stress concentration for Drag coefficient Oscillating-drag coeffic Oscillating-lift coeffic Magnification factor of $f_n = H_f H_{af} H_{as} f_a$ Reynolds No. $Re =$ $S_d = G_{SP} F'_{Mmax} P_d$ $G_{SP} = \frac{16L^2}{3\pi A^2 [1 - (d/A)^4]}$ $\overline{S_s} = 1.5S$	hank P_c MPa $p = P_t$ MPa N_S ζ factor K_t C_D ficient C_d cient C_l (V_{IR}) F'_{Mmax} $f_a = \frac{\lambda^2}{2\pi}$ $f_a = \frac{1}{2}\gamma C_d V_{IR}^2 \cdot I_d$ $\{3[1 - (L_0/L)^2] + 2(B_d)$ $d = G_{SP} P_D$ $P_D =$	$35.91 \\ 415.38 \\ \hline 0.19 \\ 0.0005 \\ 1.2 \\ 1.40 \\ 0.10 \\ 1.00 \\ 1000.0 \\ 2 \\ L^2 \sqrt{\frac{E I}{m} 10^{12}} \\ 0^{-6} \text{ N/mm}^2 \\ 8/A-1)[1-(L_0/L)^3] \\ L_0 = L - L_A \\ = \frac{1}{2} \gamma C_D V^2 \cdot 10^{-6} $
[4] [RE Fa A So Y D [Cal [1] Fi Si N S C C In [2] S V (2] S V [3] [(() (2]	Combind drag and lift Pressure Stress Calc. Operating pressure P Operating pressure P MARKS] atigue endurance limit llowable stress ensor average density oung's modulus ensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency latural Frequency cruton No. Syclic stress at the V_{IR} $(S_L=0)$ hline resonance velocity teady-State Stress Calc. at the Same equation of cyclic stress ressure Stress Calc. (Maximum)	stresses S_{omn} \boxed{Judgen} MPa 0 MPa 0 MPa 0 $S_f N/$ S N/ $\gamma_s kg$ E N/n $\gamma_m kg$ IE PTC 19.3 $f_s = St \frac{V}{D}$ $f_n^c = H_c f_n$ $N_{Sc} = \pi^2 \zeta ($ $S_{omax} = K_t 0$ V_{IR} at the $V \sqrt{\frac{(}{C})}$ he $V S_{omn}$ $Y_{Somax} = V$	$\frac{1}{12} \frac{N/mm^2}{17} \frac{17}{17}$ $\frac{1}{16} < \frac{Pass}{16} < \frac{Pass}{16$	al pressure rating for tip shal pressure rating for the tip Strouhal No. Damping factor Stress concentration for Drag coefficient Oscillating-drag coefficient Oscillating-lift coeffic Magnification factor of $f_n = H_f H_{af} H_{as} f_a$ Reynolds No. $Re =$ $S_d = G_{SP} F'_{Mmax} P_d$ $G_{SP} = \frac{16L^2}{3\pi A^2 [1-(d/A)^4]}$ $\overline{S_U^2 + (S_t - S_r)^2} \leq 1.5S$ S_d $S_d = G_{SP} F_M P_i$ $F_M = 1.1$ $F'_M = 1$	hank P_c MPa $p = P_t$ MPa N_S ζ factor K_t C_D ficient C_d cient C_l $(V_{IR}) F'_{Mmax}$ $f_a = \frac{\lambda^2}{2\pi}$ $f_a = $	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00 1000.0 $\frac{2}{L^2} \sqrt{\frac{E I}{m} 10^{12}}$ $0^{.6} \text{ N/mm^2}$ $B/A-1)[1-(L_0/L)^3]$ $L_0 = L - L_A$ $= \frac{1}{2} \gamma C_D V^2 \cdot 10^{.6}$ $0^{.6} \text{ N/mm^2}$ This shat We Recommend to be that we recommend to use in ASME.
[4] [RE Fa Sa Y D [Cal [1] Fa Sa Sa C In [2] S C [2] S V ((1) [2] S (2) [3] E (2) [3] E (2) [3] E [4] P E E	Combind drag and lift Pressure Stress Calc. Operating pressure P Operating pressure P MARKS] atigue endurance limit llowable stress ensor average density oung's modulus ensity of thermowell culation Method : ASM requency Limit Calc. trouhal frequency latural Frequency cruton No. Syclic stress at the V_{IR} $(S_L=0)$ hline resonance velocity teady-State Stress Calc. at the Same equation of cyclic stress ressure Stress Calc. (Maximum)	stresses S_{om} \boxed{Judgen} MPa 0 MPa 0 MPa 0 $S_f N/$ S N/ γ_s kg E N/n γ_m kg IE PTC 19.3 $f_s = St \frac{V}{D}$ $f_n^c = H_c f_n$ $N_{Sc} = \pi^2 \zeta$ ($S_{omax} = K_t$ V_{IR} at the $V \sqrt{\frac{(}{C})}$ the $V S_{oma}$ X. Pressure) or tip shank	$\frac{1}{12} \frac{N/mm^2}{17} \frac{17}{17}$ $\frac{1}{16} < \frac{Pass}{16} < \frac{Pass}{16$	al pressure rating for tip shal pressure rating for the tip Strouhal No. Damping factor Stress concentration for Drag coefficient Oscillating-drag coefficient Oscillating-lift coeffic Magnification factor of $f_n = H_f H_{af} H_{as} f_a$ Reynolds No. $Re =$ $S_d = G_{SP} F'_{Mmax} P_d$ $G_{SP} = \frac{16L^2}{3\pi A^2 [1 - (d/A)^4]}$ $\overline{S_{J}}^{2} + (S_t - S_t)^2 \leq 1.5S$ S_d ² N/mm ² $S_L = G_{SP} F_M P_i$ $F_M = 1.1$ $F'_M = 1$ $\frac{2.167}{B/(B - d)} - 0.0833$ MPa	hank P_c MPa $p = P_t$ MPa N_S ζ factor K_t C_D ficient C_d cient C_l (V_{IR}) F'_{Mmax} $f_a = \frac{\lambda^2}{2\pi}$ $f_a = \frac{\lambda^2}{2\pi}$ $f_a = \frac{1}{2}\gamma C_d V_{IR}^2 \cdot I_d$ $\{3[1 - (L_0/L)^2] + 2(B_d)$ $I_a = G_{SP} P_D = P_D = P_l = \frac{1}{2}\gamma C_l V^2 \cdot I_d$ I.8 Notes 3: "Pass *1" mean Freq. ratio "fs/fn" is high This ratio is not recomm Notes 4: "Pass *2." mean	35.91 415.38 0.19 0.0005 1.2 1.40 0.10 1.00 1000.0 $\frac{2}{L^2} \sqrt{\frac{E I}{m} 10^{12}}$ 0^6 N/mm^2 $B/A-1)[1-(L_0/L)^3]}$ $L_0 = L - L_A$ $= \frac{1}{2} \gamma C_D V^2 \cdot 10^{-6}$ $V^{0^6} \text{ N/mm^2}$ The sthat We Recommend to be the theorem of the set of

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