

Flange analysis in ROHR2

ROHR2flange

Program System ROHR2

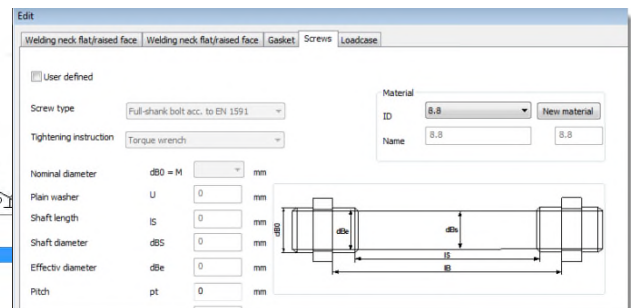
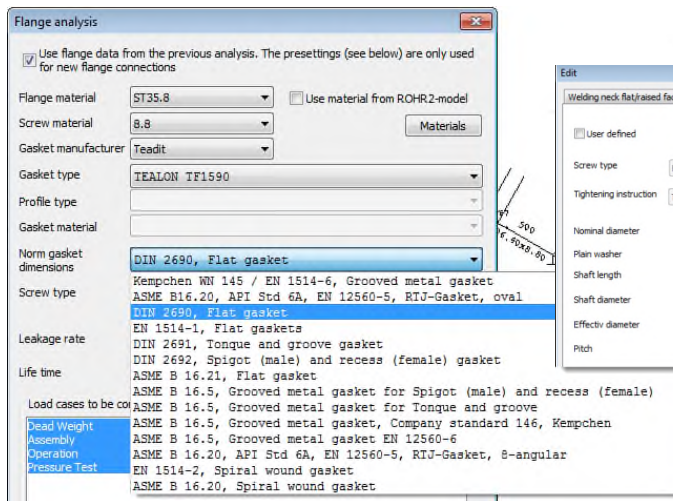
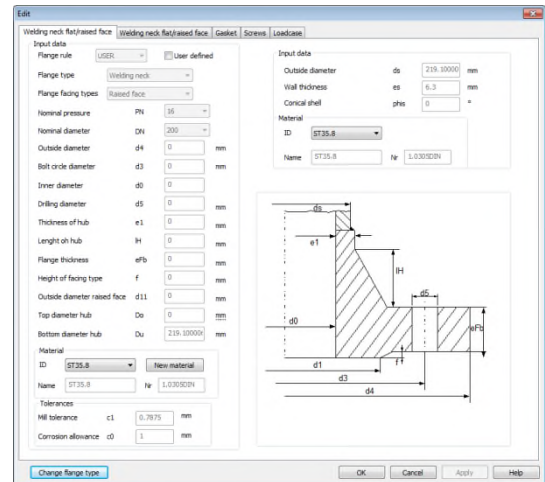
SIGMA Ingenieurgesellschaft mbH



ROHR2flange - features and functions

Flange analysis with the optional available module ROHR2flange.

- Flange analyses acc. to
 - EN 1591-1:2011,
 - EN 1591-1:2014,
 - ASME VIII, Div.1:2010
- Automatic analysis of all flanges in the system taking into account all load cases. The number of load cases can be reduced by the user.
- Automatic generation of load case combinations required for the analyses.
- Simple pre-settings of the flange parameters by means of standard values for flanges, screws and gaskets.
- The flanges may be modified individually and in detail.



- Report of the calculation results in a list

Node	Pipeline	PN	DN	F1-Type	F1-Material	F2-Type	F2-Material	Gasket n...	Gasket m...	Gasket th...	Screw type	Screw	Washer t...	Materia
53		16	400	Welding neck	10CrMo5-5	Welding neck	10CrMo5-5	B25A-PTFE	Kempchen	2.0	Full-shank ...	1	3.4	21CrMo
49				Welding neck	10CrMo5-5	Welding neck	10CrMo5-5	B25A-PTFE	Kempchen	2.0	Full-shank ...		0.0	21CrMo
45		16	200	Lap-joint fl...	10CrMo5-5	Lap-joint fl...	10CrMo5-5	B25A-PTFE	Kempchen	2.0	Full-shank ...	3/4	3.8	21CrMo
67		40	400	Welding neck	10CrMo5-5	Welding neck	10CrMo5-5	B25A-PTFE	Kempchen	2.0	Full-shank ...	1 3/8	4.2	21CrMo
3		16	400	Welding neck	10CrMo5-5	Blind flange	10CrMo5-5	B25A-PTFE	Kempchen	2.0	Full-shank ...	1	3.4	21CrMo
77		16	200	Welding neck	10CrMo5-5	Welding neck	10CrMo5-5	B25A-PTFE	Kempchen	2.0	Full-shank ...	3/4	3.8	21CrMo
81		16	200	Welding neck	10CrMo5-5	Welding neck	10CrMo5-5	B25A-PTFE	Kempchen	2.0	Full-shank ...	3/4	3.8	21CrMo

- Automatic generation of a calculation report in German or English

Calculation standards

- EN 1591-1 (2014)
- EN 1591-1 (2011)
- ASME BPV VIII (2010) welding necks with sealing strip)
- ASME BPV III, App. XI (2010), The calculation of additional forces is executed by the equation of the calculation of H. The equivalent internal pressure is determined by the loads. In ROHR2 dynamic loads are interpreted as load cases working in positive or negative direction, e.g. wind, earth quake.

Databases

Databases with data e. g. of pipes, bends, flanges or expansion joints according to technical standards or according to manufacturer's data. Databases are extendable by the user.

The ROHR2 standard version includes:

Flanges

The ROHR2flange databases include:

- EN 1092-1:2008-09, Dimensions of flanges general
- DIN 2627 – DIN 2638, Dimensions of welding necks
- ASME B16.47, Dimensions of welding necks
- ASME B16.5, Dimensions of welding necks and blind flanges

Types of Flanges

Welding neck
Lap-joint flange with flared joint (long)
Lap-joint flange with flared joint (short)
Lap-joint flange
Lapped flange with welding stub (Ring)
Lapped flange with welding stub
Threaded flange
Slip-on flange with hub
Flat face flange
Integral flange
Welding neck acc. to ASME B16.47, series A

Screws

Bolt types

Select required cross sectional data in accordance with the standard.

- Full shank bolts and reduced shaft bolts acc. to EN 1591-1, appendix A, Nom. dimensions up to M72 following EN ISO 4014 and EN ISO 4016
- Reduced shaft bolts acc. to DIN 2510
- Full shank bolts acc. to ASME B1.1

Washer/anti-fatigue sleeve

Select required dimensions in accordance with the standard:

- User defined
- ISO 7089
- ISO 7090
- ISO 7091
- ASME B 18.22.1

Bolt nut

Select required dimensions in accordance with the standard:

- ISO 4032
- ISO 4033
- ISO 4034
- DIN 2510
- ASME B 18.22.2

Gaskets

The gasket database at the moment includes more than 350 different types of gaskets of leading manufacturers (www.gasketdata.org).

Gasket dimensions are included in acc. with EN, DIN and ASME for flanges, each one including gasket profiles and sealings in accordance with different standards

Gaskets dimension standards

- EN 1514-1, flat gaskets
- EN 1514-1, tongue and groove
- EN 1514-1, male/female gasket
- EN 1514-2, Spiral-wound gasket
- DIN 2690, flat gaskets
- DIN 2691, tongue and groove
- DIN 2692, male/female gasket
- EN 1514-6, Grooved gasket
- EN 1514-4, Corrugated gasket
- Kempchen WN 104, Spiral-wound gaskets
- ASME B 16.21, flat gasket
- ASME B 16.5 Grooved gasket, male/female
- ASME B 16.5 Grooved gasket, tongue and groove
- Kempchen WN 146 Grooved gasket, male/female gasket
- ASME B 16.20, API Std 6A, EN 12560-5, RTJ gasket
- ASME B 16.20, Spiral-wound gaskets
- User defined gaskets

Company Address	Kempchen Dichtungstechnik - 46049 Oberhausen - Im Waldleich 21
Gasket Type	Flachdichtung F1 RS2K110-A
Thickness t_{max} [mm]	92 x 49 x 2 mm

L [mg/(s·m)]	Q_{seal} [MPa]	Q_{min} (at assembly), Q_{max} (after off-loading) for $p = 40$ bar							
		$Q_a = 20$ [MPa]	$Q_a = 40$ [MPa]	$Q_a = 60$ [MPa]	$Q_a = 80$ [MPa]	$Q_a = 100$ [MPa]	$Q_a = 120$ [MPa]	$Q_a = 140$ [MPa]	$Q_a = 160$ [MPa]
10^0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
10^1	15	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
10^2	39	< 10	38	12	< 10	< 10	< 10	< 10	< 10
10^3	73				56	28	28	28	11
10^4	112								36
10^5	151								135
10^6									
10^7									
10^8									

Relaxation ratio P_{rel} for stiffness $C = 520$ 1/N/mm			
Gasket stress [MPa]	ambient temperature	temperature 1 [200 °C]	temperature 2 [300 °C]
Stress level 1 [50 MPa]		0.99	0.96
Stress level 2 [120 MPa]		1.00	0.98
Q_{min} [210 MPa]		1.00	0.99

Maximal applicable gasket stress Q_{max}		
Q_{max} [MPa] – ambient temperature	Q_{max} [MPa] – temperature 1 [200 °C]	Q_{max} [MPa] – temperature 2 [300 °C]
210	210	210

Sekant unloading modulus of the gasket E_g [MPa]			
Gasket stress [MPa]	ambient temperature	temperature 1 [200 °C]	temperature 2 [300 °C]
20	440	463	561
30	490	737	647
40	1029	1116	1051
50	1103	1141	1264
60	1480	1417	1390
80	2122	2094	1749
100	3479	2811	2237
120	2985	2721	3348
140	2728	2888	3433
160	3109	3224	2967
180	3848	3591	3133
200	4285	3842	3191
210	4766	3512	3350

Note: the content of darkened cells was not determined respectively is unnecessary

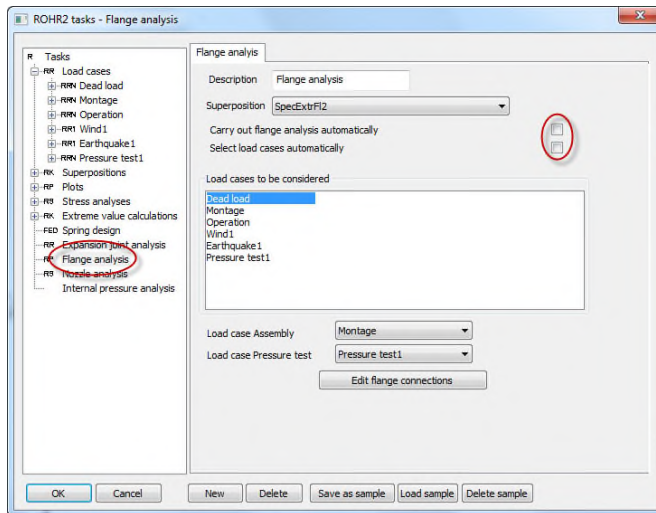
Creation date of this sheet: 11.05.2009

Manufacturers of gaskets

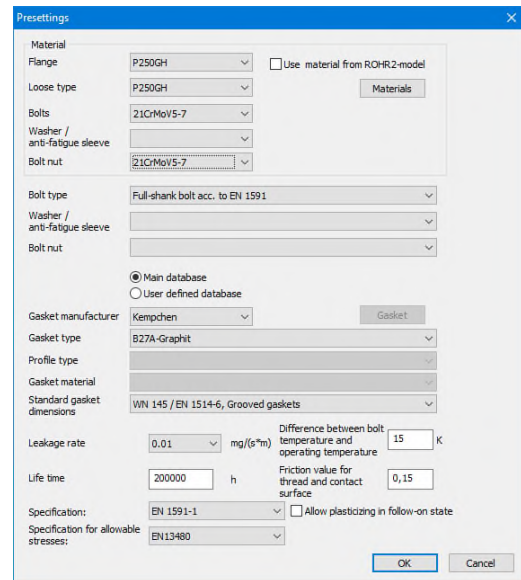
- A.W. Schultz
- AVKO
- Beyer GmbH
- Burgmann
- Donit Tesnit
- Durlon
- Eagle Burgmann
- Eriks
- Flexitalic
- FluorTex
- FMI
- Frenzelit
- Gambit-Lubawka
- Garlock
- Hecker
- IDT
- James Walker
- Jungtec
- Kempchen
- Klinger
- Kroll&Ziller
- KWO
- Leader Gasket
- M. Zilken GmbH
- Matusza
- Möller
- Montero Fibras Y
- Reinz
- Revo seal
- SGL
- Spetech
- Teadit
- Tedima
- Triangle Fluid Controls
- W.L. Gore

The application of ROHR2flange

Starting ROHR2flange in a ROHR2 Project



Start ROHR2flange in ROHR2win by Loads | Tasks | Flange analysis.



Flange analysis, Basic settings

SIGMA	SIGMA Ingenieurgesellschaft mbH	ROHR2			
Comm.:	Bertha-von-Suttner-Allee 19 D 59423 Ulfra	Date: 28.01.18			
Project:	ROHR2-Schulung-Beispiel 1 Leistung DN200/150				
1 - Flange analysis acc. to EN 1591 at node 17 // DN 150 - PN 25					
Abstract					
Flanges	Flange 1	Flange 2			
Flange type	Welding neck	Welding neck			
Standard	EN 1092-1/11/PN25	EN 1092-1/11/PN25			
Facing type	Raised face	Raised face			
Nominal pres.	PN 25	PN 25			
Nominal diam.	DN 150	DN 150			
Material	P250GH / 1.0460	P250GH / 1.0460			
Description					
Pipes	Pipe 1	Pipe 2			
Outer diam.	168.30 mm	169.30 mm			
Wall thick.	5.60 mm	5.50 mm			
Material	P235GH / 1.0345	P235GH / 1.0345			
Bolts	Full-shank bolt acc. to EN 1591 (ISO 4014)				
Type	M 24 x 3.00				
Diameter	8				
Number	3				
Friction μ	0.15 (average normal state)				
Tightening	Torque wrench				
Material	21CrMoV5-7 / 1.7709				
Gasket					
Name	B27A-Graphit				
Manufacturer	Kempchen				
Date of creation	20.1.2014				
Type	Flat gasket				
Leakage	0.01000000				
Dimensions acc. to	190.00 x 170.00 x 4.50 WN 145 / EN 1514-6, Grooved gaskets				
Results					
Min. tightening torque					
Mnom	167.47 Nm per bolt				
At a max. tightening torque of					
MaxM	260.00 Nm per bolt				
the first component to fail is/are the Flange 2					
Flange 1	Flange 2	Bolts			
99.95 %	99.95 %	47.67 %			
		18.16 %			
Average tightening torque 213.73 Nm per bolt is determined					
Util.	Bolts	Gasket	Flange 1	Flange 2	Deformation
Assembly	24.38 %	11.83 %	36.43 %	36.43 %	0.19 *
Dead load	28.47 %	6.62 %	63.35 %	63.35 %	0.17 *
Operation	23.72 %	9.37 %	66.50 %	66.60 %	0.21 *
Shutdown	31.10 %	9.72 %	40.97 %	40.97 %	0.15 *
Pressure test	16.82 %	6.14 %	26.54 %	26.54 %	0.18 *

Report, documentation

Documentation:

- All flanges in one document
- or one flange/document
- Input data, e.g.:

Flange type / sealing face

- Norm / pressure level
- Nominal width and material
- Screw type, -size, -number
- Tightening method
- Gasket manufacturer, -type and leakage class

Results:

- Stress analysis
- Tightening moment

Program license and system requirements

Program version, network license

ROHR2flange is an optional available module in the program system ROHR2. It can be part of the ROHR2 single user license and ROHR2 network license. In the ROHR2 network license the number of the users of an optional module can be similar or lower than the number of ROHR2 network seats. For system requirements and program features see ROHR2 specification. ROHR2flange is not a stand-alone application. The installation of **ROHR2** is required

Scope of delivery and license key

The programs´ scope of delivery contains

- the program data
- the program documentation in html format
- unlocking the module on the ROHR2 license key.

The software does not run without the license key. In case of updates/upgrades the license key will be replaced or updated.

Documentation /User manual

The functions of ROHR2flange are part of the ROHR2 online help.

Maintenance and user support

Advice about installation and application is done by the ROHR2 user support (hotline). The hotline is part of the included service after purchase, during time limited licensing (rent) and as a part of a maintenance agreement. Interfaces and additional programs are integrated into ROHR2. Maintenance of additional programs and interfaces is mandatory in this case.

Software Development, Sales and Support

SIGMA as one of the leading engineering specialists in the Pipe Stress Business offers ROHR2, PROBAD and SINETZ: field tested software products, strongly adapted to the user´s needs. SIGMA engineering division is known as a partner of choice offering consulting services for plant engineering, chemical industry, engineering companies, energy suppliers and technical security boards.

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