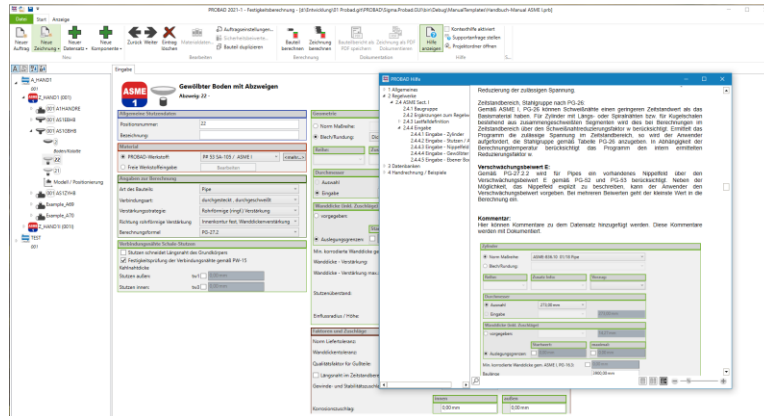




PROBAD

Code-based Strength calculations of Pressure parts



PROBAD 2022-1 New Features and Improvements

The program system PROBAD is checked and modified continuously within the scope of the maintenance agreement.

List of innovations, improvements and corrections of the new PROBAD-Releases

ASME I,	Edition 2021,	Release 5.03
ASME VIII/1,	Edition 2021,	Release 8.01
ASME B31.1,	Edition 2020,	Release 4.04
ASME B31.3,	Edition 2020,	Release 2.04
ASME-Piping series		Release 1.12

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Materials according to ASME II-D, Edition 2021:

Materials according to ASME B31.1, Appendix A, Edition 2020:

Materials according to ASME B31.3, Appendix A bzw. Appendix K, Edition 2020:

A detailed documentation of all available ASME materials can be found on the PROBAD start interface in folder 'Information' under the name 'ASME PROBAD Material numbers'.

In this document for all materials the corresponding sources and page references from ASME II-D, ASME B31.1, Appendix A and/or ASME B31.3, Appendix A or K are listed.

ASME II-D, Edition 2021 and ASME B31.3, Edition 2020 were released in 07/2021:

All relevant material data was updated in the PROBAD material database.

Source ASME II-D: The following new materials were added:

PROBAD Number	Nominal Composition	Product Form	Specific. No.	Type/Grade Class
No. 128	22Cr-5Ni-3Mo-N	Seamless tube	SA-789	S32205

Source ASME B31.3: The following new materials were added:

PROBAD Number	Nominal Composition	Product Form	Specific. No.	Type/Grade Class
No. 560	42Ni-21.5Cr-3Mo2.3Cu	Plate&Sheet	B424	N08825
No. 561	42Ni-21.5Cr-3Mo2.3Cu	Pipe&Tube	B705	N08825
No. 562	42Ni-21.5Cr-3Mo2.3Cu	Pipe&Tube	B423	N08825
No. 563	42Ni-21.5Cr-3Mo2.3Cu	Fitting	B366	N08825
No. 564	42Ni-21.5Cr-3Mo2.3Cu	Forging	B564	N08825



ASME I, Edition 2021, Release 5.03

ASME I, new Edition 2021:

- In comparison with Edition 2019 there are no changes in ASME I, Edition 2021, which are relevant for the strength calculation.

Low temperature:

- Calculations at temperatures below -10°C or 14°F are done with material strength values at room temperature. In the new release a correspondent hint is displayed.

External pressure:

- Up to now for some external pressure charts (CS-2, CS-3, CS-5, HA-3, HA-4, NFA-7 und NFT-2) the factor B according to ASME II-D, Subpart 3 was determined via polynomial approximation. Now also for these charts (as for all other external pressure charts) the factor B is determined via linear interpolation of the correspondent table values in Subpart 3. For these external pressure charts the results may differ slightly.

Nozzles:

- Additional type of connection ,set on and milled plane':
If not entered, the milling depth h1 is determined internally for milling diameter $dx = dni + 6 \text{ mm} = dni + 1/4 \text{ inch}$. The remaining shell thickness is checked internally and taken into account during the reinforcement calculation.
- If the reinforcement radius of an opening in a dished head protrudes into the knuckle area, a corresponding warning is displayed and the restriction of the reinforcement radius via input is advised.

ASME VIII/1, Edition 2021, Release 8.01

Changes ASME VIII/1, new Edition 2021:

- Dished head:
According to UG-33(a)(1) for elliptical and torispherical heads under external pressure P_e the additional proof with $1.67 P_e$ as internal pressure is omitted.
- Flat heads:
For flat heads of type (s) the formula in UG-34(d)(14) to restrict maximum allowable pressure has been corrected for SI units: $P_{max} = 5 S / d$.
- Tubesheets:
The formulas to determine the shear stresses were modified according to UHX-12.5.9, UHX-13.5.8 and UHX-14.5.8.
- Conical shells:
The limit angle Delta is now determined according to Appendix 1-5, formula (1) or Appendix 1-8, formula (1).
Now the effective area of reinforcement A_{eS} at the small end of the cone is determined according to Appendix 1-5, formula (8) and (10) or Appendix 1-8, formula (7) and (9).
Now the effective area of reinforcement A_{eL} at the large end of the cone is determined according to Appendix 1-8, formula (3) and (5).



ASME VIII/1, Edition 2021, Release 8.01

Low temperature:

- Calculations at temperatures below -10°C or 14°F are done with material strength values at room temperature. In the new release a correspondent hint is displayed.

External pressure:

- Up to now for some external pressure charts (CS-2, CS-3, CS-5, HA-3, HA-4, NFA-7 und NFT-2) the factor B according to ASME II-D, Subpart 3 was determined via polynomial approximation. Now also for these charts (as for all other external pressure charts) the factor B is determined via linear interpolation of the correspondent table values in Subpart 3. For these external pressure charts the results may differ slightly.

Nozzles:

- Large openings have to be proved according to ASME VIII/1, Appendix 1-7 additionally. Up to now the related results were documented via a corresponding message. Now the values, determined according to Appendix 1-7, are documented in the results.
- If the reinforcement radius of an opening in a dished head protrudes into the knuckle area, a corresponding warning is displayed and the restriction of the reinforcement radius via input is advised.
- If the reinforcement radius of an opening in a dished head protrudes into the area of the cylindrical skirt, a corresponding warning is displayed and the restriction of the reinforcement radius via input is advised.

Flanges:

- Up to now the maximum allowable pressure determined by PROBAD probably might have led to a invalid flange rigidity factor J. In the new release additionally the condition $J \leq 1.0$ is taken into account during the determination of the maximum allowable pressure.
- If no ,outer effective gasket diameter Go' is entered, Go is defined internally via the ,minimum distance to the bolts'. In this case a corresponding hint is displayed now.
- If no gasket width N was entered, up to now a minimum width was defined internally. Often this minimum value was not realistic. So the gasket width N must be entered now.
- For optional-type flanges according to ASME VIII, Figure 2-4, Sketch (8) – (10) a warning is displayed now, if the thickness of the fillet weld between flange plate and attached shell is smaller than the minimum value according to Figure 2-4.

Control calculations:

- In menu ,Help > Help Index > .Control calculation' detailed manual control calculations are now available for all types of components. The corresponding input files can be opened and calculated in the order A_HAND1.



ASME B31.1, Edition 2020, Release 4.04
ASME B31.3, Edition 2020, Release 2.04

ASME B31.3, new Edition 2020:

- In comparison with Edition 2018 there are no changes in ASME B31.3, Edition 2020, which are relevant for the strength calculation.
- For several materials the allowable design stresses according to Appendix K have changed. The ASME material database has been revised accordingly.



ASME-Piping Series, Release 1.12

Check of additional temperature values:

Additionally to the design point (calculation pressure and calculation temperature) up to 100 further temperature values can be defined in the new release via the switch 'Check other temperature values'.

In this case the maximum allowable internal and/or external pressure of the total piping series is determined for this check points.

If the correspondent pressure P für a temperature value is entered additionally, also the actual usage ratio is calculated for this load combination.

The results are documented in a summary table.

Bended pipes and elbows:

Up to now different ranges of pipe bends and elbows were not allowed to contain identical diameters. In the new Release this is only true for straight pipes.

So now in one calculation for example 2D-bends can be defined in one range and 3D-bends in another range with the same diameter range.

Additions / Corrections:

- When calling the 'Individual branch selection' for the first time, the loading of all diameter combinations of the straight pipes can now be switched off.
- Under special circumstances, an individually selected direction of reinforcement was ignored during individual branch selection. This has been corrected.
- The results table for branches was sometimes split on several output pages. This has now been corrected.
- For bended pipes deviating wall thickness can also be specified for special diameters.



User Interface

Features

- The type of flat ends is now shown in a two-column layout.
- The mutual influences of nozzles according to EN 13480 are now displayed separately in 2 tables: 1 table for the positioning of nozzles and 1 table for the calculation results of the mutual influences.
- In the output of mutual influence, a comment is now displayed when nozzles intersect each other.
- If information on diameter rows is available, these are now displayed in the diameter selection.
- When a new nozzle is created in the model view to enter a changed angle of inclination, the required data is now requested in a dialog.
- The table of load case results for conical shells have been adapted to those of the other components.
- Results of gasket on bolted flat ends according to EN 13480 are now output in separate block.
- More information is now displayed in the branch positions overview table.
- Reducer with deviating materials of the connection cylinders can now be fully documented.
- Comment supplemented by material number- and name if a material is used for several components.
- Position and inclination information is now displayed in the tooltip of the nozzle position.
- Mutual influences are displayed for branches on conical shells too.
- The component from which the minimum required test pressure results is printed on the front page.
- Nozzles on cylinders calculated according to ASME I can now also be positioned relatively.
- Relative nozzle positions are now also displayed in the overview model.
- The text of the button for changing the report length is now adapted to the currently displayed report.
- Updated Helpfiles for Nipples and the Report-Preview.
- The fixed diameter was eventually not set correctly on switch from user defined to standard dimension.
- For reducers, the type (concentric/eccentric) only needs to be specified at one point.
- In the tables of nozzle distances and mutual influences according to ASME, the sequential number of the branches is now displayed.
- Input of reducers with different connection cylinders.
- Use default disc representation for flat ends, if there is not enough information for a detailed model.
- Positioned welds on cylindrical shells, elbows and dished heads are now displayed.
- Welds on the main body in the reinforcement area of openings are now displayed.
- For dished heads acc. to EN 13480 the required wall thickness of knuckle- and skirt-area is displayed, even if a wall thickness of the dished head is defined as constant.
- In the edition of EN 13480, the suffix "-3" is also output.
- For the material stress values according to EN, the values are now listed in blocks according to operation and test.
- The weld factor is only taken into account during internal pressure operation. This is now indicated in the output.
- If the creep rupture strength value of 100,000h has been extrapolated to 200,000h, this is indicated.
- The sequential no. of a component is now also output for nipple fields.
- If a nipple field is positioned several times on the main body, the detailed results are output only once.
- Welds on dished heads may be entered now.
- A tooltip in the material dialog now shows for which sets of rules a material can be calculated.
- Page number is shown in the material datasheet.
- Page number is shown on front pages of calculation output, too.
- Offset of nozzle axis is output in table.
- Relevant equation for wall thickness of flat ends in assembly load case output separately.
- For the material data, the source of the creep values is output separately if it is different from that of the strength values.
- For dished heads acc. to EN13480 the factor beta is output even when no deviating wall thickness is defined for crown section and cyl. collar.
- T fittings according to standard can now be entered and calculated according to EN 13480.
- Result output for T-Fittings completed.



- If the wall thickness of the main body varies in the area of the branch in the case of T-fittings, the geometry is output separately.
- Result output for T-Fittings completed.
- If the wall thickness of the main body varies in the area of the branch in the case of T-fittings, the geometry is output separately.
- Y-shaped pieces can now be entered.
- Result output for Y-shaped pieces completed.
- T-/Y-Pieces output in pressure part list.
- The settings for the documentation of new orders can now also be stored as default for new projects.
- In the pressure parts list, the maximum usage ratio of a dataset is printed in red if it is above 100%.
- Added several abbreviations to the input fields.
- The branch length of a T-shaped piece is now read out in design calculations after the calculation, and used for the model.
- Some interface objects have been desaturated to make them less prominent.
- Some font colors were adjusted to achieve a contrast ratio of 7:1.
- In pressure part list the PROBAD-Logo will be printed now.
- In pressure part list the order- and drawing- name/number will no longer be printed on first page, because the data can be found in the header.
- In pressure part list only one legend will be output for both types of table (List of datasets and overview components).
- In the result output of the EN 13480 the density of the material will be printed.
- The flexibility factors acc. to EN 13480 App. H will no longer be output.
- The index of the calculation diameter of a flat end acc. to EN 13480 will be adapted to the type of flat end.
- The selection of the type of production for bends a detailed explanation is shown in the ToolTip
- Adds abbreviations for nozzle-connections.
- An internal report is now displayed when viewing the results, the creation is much faster. PDF report remains available via the Reports menu.

Bugs fixed

- In the load case results of EN 13480, a calculation test pressure was incorrectly output, although only the max. permissible test pressure was determined.
- The Classic long output was not displayed for EN 13480.
- For bends according to EN 10253-4-A, all possible diameters are now listed when selecting the preference "All thicknesses EN 10220".
- Deviating geometry at the thin end of flat ends with conical neck was not displayed.
- Results of bolts on flat ends acc. to EN 13480 were missing and are now displayed.
- The relevant value for allowable stresses was not output for the connection cylinder of a flat end.
- Safety factor external pressure was not displayed for dished heads acc. to EN 13480.
- The position of the weld was not output for pipe bends according to EN 13480.
- Missing values of nozzles on conical shells added.
- Texts of standard-rows were always displayed in English.
- The input of the component length of a standard-reducer is now optional.
- During nozzle positioning, a different radial angle was output than the one manually entered.
- Additional information on standards was always displayed in English in some cases.
- The determined stress for cylinders under external pressure may not have been displayed correctly in the interface.
- Result output of a calculation without operation load case was not possible.
- Internal volume was not converted if the input unit was different from the output unit.
- Abbreviations of height/width of a stiffener on the front page were interchanged.
- Safety coefficient of cold-formed and hot-formed stiffeners were missing.
- Under certain conditions, no mutual influences were documented.
- Nozzles on dished heads will now always show up above the head.
- The term "mechanical allowance" has been replaced by "manufacturing allowance" for EN 13480 bends.



- Removed an unused Combo box from material selection
- Parts of the material dialog were always in English.
- The material data sheet will now be created in the language of the user interface.
- For some materials, the microstructure was not displayed in the overview list.
- The table "Cone junction as stiffening" was output although no data existed.
- All specifications can now also be made for flange rings.
- When selecting a component standard, the tolerance standard may not have been updated.
- Added missing inputs for block flanges.
- Disabled input of wall thickness for standard T-Pieces.
- The defaults for the documentation are transferred for new orders now.
- Use correct diameter for relative nozzles for the 3D-Model
- The input dialog for material properties now displays input units.
- For some Materials, the material Family was not listed.
- The list of nozzle positions now shows the correct text for branches in the bend.
- Show input for the position of the longitudinal weld on bends for EN.
- Show abbreviation for internal nozzle projection.
- The input of nozzle projections <0.0 are now handled.
- When entering user-defined materials according to EN, units are now displayed.
- Fixed a bug which leads to a slow user interface, if files on network shares were part of the list of recent files.
- For some components, too few or too many tolerance standards were listed in the interface.
- Eventually the "Report Drawing" Button was disabled.
- No component-images may have been printed in the report.
- When entering a standard elbow, the correct radius of curvature may not have been preset.
- In the result-output table headings were not displayed correctly.
- Help graphics are now also displayed in English when this is selected as the interface language.
- In pressure part list now the standard of the components and the company name in the table header are displayed.
- The pressure part list is now displayed correctly when a dataset only contains external pressure results. Previously, this could lead to an error.
- The logo in the header of the pressure parts list is now scaled correctly.
- The table cell for the company name has been widened to avoid a line break within the table.
- In the results view on the user interface, the borders around the PROBAD logo in the table header were missing.
- If there is no load case operation-internal pressure, results were partly displayed incorrectly.
- Fixed an error that caused incorrect display of the connection between the nozzle and the main body.
- Fixed an error that caused incorrect display of the inner projection of nozzles.
- Hemispherical heads with skirt are now also displayed again.

Miscellaneous

- Geometry of main body connection on front page.
- Format changed to avoid line break in table of nozzle reinforcement.
- Keep tables of mutual influence & Load case results ext. pressure on one page.
- Keep all results operation/test together on one page in nozzle-reinforcement
- Save dialog removed when closing the application, automatic saving can be configured in the application settings.
- Geometry data regarding to the connection cylinder of flat ends are no longer displayed in the results for the flat end, but in the geometry of the connection cylinder.
- Right align result-grid contents
- The calculation temperature is identical for internal and external pressure and is only output once.
- Type-specific data of dished heads are now displayed separately.
- Allow. stresses for dished heads incl. openings is now output in table of load case results.
- In the overview table on the first page, a sequential number of the nozzle and nipple fields is now output.



- In the tables of nozzle and nipple field positioning, the sequential number is output in a separate column.
- For branches on pipe bends, the inclination and circumferential angle are now also output in table of positioning.
- Type-specific geometry of flat ends added in short result.
- The filename for reports of whole drawings gets preset now.
- In the ASME material data sheet, the legend of the physical properties is output under the table with the characteristic values.
- In the pressure part list, the page number is now output in the footer.
- In the pressure parts list, the text is output in red if the calculation of a data set was canceled.
- In addition to the module release, the corresponding year is now also displayed in the header of the results output.
- For multiple positioned nozzles, the reinforcement areas are now output if they differ from those of the base nozzle and lead to worse results.
- A progress bar is displayed during report creation.