Engineering & Industrial Petrochemical Company (IPN)

Piping Systems Research & Engineering Co. TRUBOPROVOD (NTP Truboprovod)

"PASSAT" PROGRAM

Open data format (XML)

Version 1.0

Reference Guide

Moscow

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Annotation

Starting with version 2.01 “PASSAT” program supports import and export to open data format file.

Open data format file of “PASSAT’ program is designed for data exchange with other systems.

Open data format file is implemented by XML, due to which it can be easily used for “PASSAT” integration with the end user solutions.

Open format information represents an object model of program and is sufficient for setting/retrieving all model parameters essential for strength analysis of vessels and apparatuses.

This document is to be considered as a reference guide to the file format. There might be some insignificant differences between this Guide's content and the program installed, as the program will be constantly updated.

Contents

1 General

Open data format file allows “PASSAT” users to perform data exchange with other systems.

Open data format is XML-based format , described hereof.

Format structure corresponds to “PASSAT” object model and can be adapted for specific tasks by XSLT conversion or direct translation from/to XML, performed by ad hoc program.

2 "PASSAT" object model

Generally PASSAT data model represents a tree structure composed of linked objects, which include vessel (apparatus) elements and their parts, along with material, soil, insulation and lining properties. Elements include encapsulated objects, geometrical parameters, used materials, pressure, temperature, loads and other analysis data.

Besides, the object model includes general data on analytical model.

Along with object model the open format includes some program settings effecting on model displaying and program behaviour (see Fig. 1 & 2):

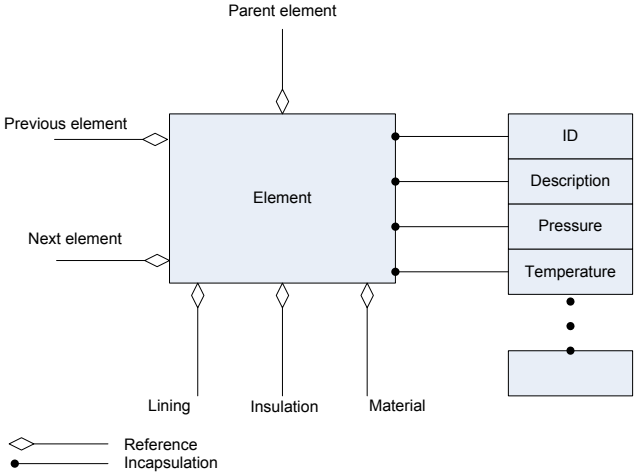

Fig. 1. Element representation

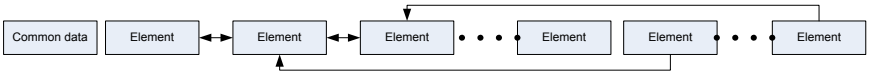

Fig. 2. Object model representation

3 XML format

3.1 File structure

File content is placed inside `<truboprovod_serialization>` tag, which identifies content type (object model of equipment) and open format version, and has the following attributes:

Attribute	Value
`signature`	«equipment»
`version`	1

Object model is placed inside `<document>` tag, which defines object model's designation, version number and equipment type.

Attribute	Value
`type`	«passat»
`Version`	Program version number
`Apparatus`	«horizontal» – horizontal apparatuses «vertical» – vertical apparatuses «column» – columns

The object model information is in the `<Data>` tag without parameters.

3.2 Minimum XML

Minimum XML file of PASSAT open data format is as follows:

```
<?xml version="1.0" encoding="utf-8" standalone="yes" ?>
<truboprovod_serialization signature="equipment" version="1">
  <document type="passat" version="2.01" apparatus="horizontal">
    <Data>
    </Data>
  </document>
</truboprovod_serialization>
```

Such XML defines blank program data file with default settings.

3.3 XML with data

In general XML file looks like this:

```
<?xml version="1.0" encoding="utf-8" standalone="yes" ?>
<truboprovod serialization signature="equipment" version="1">
  <document type="passat" version="2.01" apparatus="horizontal">
    <Data>
       { Visualization parameters }
       { Components }
    </Data>
  </document>
</truboprovod_serialization>
```

Visualization parameters – sequence of tags `<RenderParam>` (see i. 0)

Components– sequence of tags `<Component>` (see i. 3.6)

XML file example – see i. 3.8.

3.4 Measurement units

Assignment of numerical values of physical parameters is based on so-called MTS (meter-ton-second) system, which consists of the following basic units:

Length	Meter, m
Weight	Ton, t
Time	Second, s
Angle	Radian, rad
Temperature	Celsius degree, °C

Other measurement units are defined as derivatives from basic ones*;* for instance, forces are assigned in ton-forces, tf.

3.5 General data

Visualization parameters are assigned by `<RenderParam>` tags , each of them identifies specific parameter by `name` attribute.

Name attribute value	**Visualization parameter value**
`Antialias`	0/1 – image smoothing
`AutoChangeID`	0/1 – Recently selected command appears in toolbar
`DrawQuality`	Rendering quality conditional parameter, from 0 to 100
`DrawQualityMode`	0/1 – optimal quality/adjustable
`DynMode`	0..2 – View in rotation mode
`Element_Color_ID_R`	ID element color adjustment in RGBA format
`Element Color ID G`	
`Element Color ID B`	
`Element Color ID Alpha`	
`FemModelView`	0/1 – Show finite element model
`FineElems`	0/1 – Advanced view quality of elements
`MeshQuality`	Not used
`RecentNum`	Number of recently opened documents
`SmoothMode`	0/1 – Smooth transitions in view modes
`System Color N R`	System color adjustment in RGBA format N = 0 – background color N = 1 – size color N = 2 – mark color
`System Color N G`	
`System Color N B`	
`System Color N Alpha`	
`nDigits`	Number of significant figures at rounding off
`nSlices`	Number of decomposed sectors

3.6 Representation of objects

Basic elements of PASSAT model (shells, heads, etc.) are represented in XML as *components*: Information is contained in tag `<Component>`.

Elements may include encapsulated objects (welds, insulation parameters, material properties, etc.). Encapsulated object is contained in `tag<Object name="">` , where object type (name) is defined by attribute `name` . At the same time, the encapsulated object can be composite and include integrated encapsulated objects.

Parameters of components and objects are contained in tags <Param name="">, where parameter type (name) is defined by attribute name.

In all further references to the named objects and parameters we mean `name` attribute value.

Each element is identified by unique number — parameter `ID`. Object type is defined by parameter `Type` (see i. 3.8).

3.6.1 General o of components

Option	Value
`Type`	Component type
`ID`	Current element number
`ID_Next`	Internal number of previous branch element
`ID_Parent`	Parent element number
`ID_Prev`	Next branch element number
`Hl<WorkMode>.<CorrMode>.`	Pouring height at calculation mode <WorkMode> with allowance for corrosion<CorrMode>, m
`InsPresent`	Insulation availability
`LinPresent`	Lining availability
`Label`	Label
`Name`	Component name
`Name_Parent`	Parent element name
`Norm`	Calculation standard index, depends on specific component
`Temp`	Calculation temperature, C
`c1`	Corrosion allowance, m
`c2`	Negative allowance, m
`c3`	Technological allowance, m
`D`	Inside diameter, m

Encapsulated object	Description
`GetMaterial`	Material parameters (see i. 3.7.4)

3.6.2 Elliptic head

Parameter	Value
H	Head height, m
h1	Beading length, m
s	Wall thickness, m
sDescr	Description of component at its retrieval from database
sStandart	Name of standard at its retrieval from database
ss	Wall thickness of adjacent element, m

3.6.3 Cylindrical shell

Parameter	Value
Ls	Cylindrical shell length
fl	Fixation of cylindrical shell — intermediate support position
FixType	Cylindrical shell fixation type
F	Axial force in operating conditions, tf
M	Bending moment in operating conditions, tm
Q	Lateral force in operating conditions, tf
FTest	Axial force in test conditions, tf
MTest	Bending moment in test conditions, tm
QTest	Lateral force in test conditions, tf

Encapsulated object	Description
GetCyclic	Low-cycle strength calculation parameters
GetCircSeam	Circumferential weld parameters
GetAkSeam	Stiffering ring weld parameters
GetInsulation	Insulation parameters
GetLining	Lining parameters

3.6.4 Conical head

Parameter	Value
BottomType	Head type
Alpha1	Shell or head wall tilt angle, rad.
Alpha2	Adjacent conical element's wall tilt angle (if any), rad.
s2	Wall thickness of reinforcing element, m
a2D	Reinforcing element length, m
r	Toroidal raised edge length, m
Ak	Area of stiffering ring (if any), m^2
tj	Total thickness of welds (if any), m^2
GetUnit	Reinforcing assembly of conical element

Encapsulated object	Description

GetMaterial_s2	Section material parameters s2
GetMaterial_Ak	Stiffering ring material parameters Ak:
GetCyclicUnit	Reinforcing assembly low-cycle strength calculation parameters

3.6.5 Conical transition

Parameter	Value
D1	Second (right, upper) base inside diameter, m
X0	X-direction displacement of the second base, m
Y0	Y-direction displacement of the second base, m
GetLeftUnit	First (left, lower) reinforcing assembly of conical element
GetRightUnit	Second (right, upper) reinforcing assembly of conical element

3.6.6 Reinforcing element

Parameter	Value
UnitType	Conical element reinforcement type
s1	Element wall thickness s1, m
s2	Element wall thickness s2, m
st	Element wall thickness sT, m
a1D	Element length s1, m
a2D	Element length s2 l, m
rt	Toroidal raised edge length, m

Encapsulated object	Description
GetMaterial1	Section material parameters s1
GetMaterial2	Section material parameters s2
GetMaterialAk	Stiffering ring material parameters Ak:

3.6.7 Flat cover

Parameter	Value
s2	Cover flange thickness, m
a	Weld cathetus, m
r	Undercut radius, m
Gamma	Wall tilt angle in type 10, rad.
D2	Minimum diameter of cover's outside thinned part, m
D3	Diameter of bolted circle, m
Dsp	Gasket mean diameter, m
s3	Cover thickness out of seal, m
s4	Head's thinned part thickness in circular recess point, m
Fpr	Gasket reaction in operating conditions, tf
Fbr	Loading on bolts in operating conditions, tf
Fbm	Loading on bolts at tightening (mounting) , tf
Fpr_TEST	Gasket reaction in test conditions, tf
Fbr_TEST	Loading on bolts in test conditions, tf

Fbm_TEST	Loading on bolts at tightening (test conditions), tf

Encapsulated object	Description
GetMaterial_Pad	Gasket material

3.6.8 Ribbed plain cover

Parameter	Value
BushBoss	Weldolet or bushing 0 – no 1 – bushing 2 – weldolet
d0	Central bushing outside diameter, m
s0	Central bushing thickness, m
H0	Bushing height, m
h0	Distance from cover bottom surface to the lower butt of bushing, m:
c0	Allowance for bushing thickness, m
n	Number of ribs
Q0	Additional force, tf

Encapsulated object	Description
GetBushMaterial	Bushing (weldolet) material properties:
GetRib	Reinforcing rib properties

3.6.9 Spherical unbeaded cover

Parameter	Value
R	Inside radius, m
T	Ring width, m
s2	Adjacent shell thickness, m
e1	Displacement from ring centre, m
e2	Distance from inside surface of ring to the bolted circle. m
e3	Distance from of gasket reaction line to the bolted circle, m
Fpr	Gasket reaction in operating conditions, tf
D	Bolt diameter, m

Encapsulated object	Description
GetSeam_k	Stiffering ring weld parameters

3.6.10 Torispherical head

Parameter	Value
r1	Spherical radius, m
d	Central zone diameter, m

R	Curve radius, m
AssemblType	Manufacturing technique

Encapsulated object	Description
GetASeam	Weld parameters
GetBSeam	

3.6.11 Flange joint

Parameter	Value
FlangeStandart	Calculation standard
ASMEType	Free/integral
Isolated	Insulated 0 – no 1 – yes
TightControl	Control of tightening
Groove	Availability of groove
IncludeCorrosion	Make allowance for corrosion at stiffness calculation
Tf_1, Tf_2	Flange temperatures, oC
Tb	Bolt temperatures, oC
Tk	Ring temperatures, oC
NcCycles	Number of assemblies and disassemblies
DeltaTf	Flanges 1 & 2 temperature fluctuations
DeltaTb	Bolt temperature fluctuations
DeltaTk	Ring temperature fluctuations
FlVersion_1, FlVersion_2	Flanges 1 & 2 versions
FlType	Flange joint type 0 – Butt-welded 1 – Flat welded 2 – with free rings 3 – with clip rings 4 – contact 5 – combined
VersionInvert	For “combined” type 0 – “Welded flat ” 1 – “Flat welded”
BoltsType	Type of restraint 0 – studs 1 – bolts
n	Number of bolts
d	Diameter of bolts, m
h_1, h_2	Flange height, m
l_1, l_2	Conical bushing length, m
s0_1, s0_2	Thickness of bushing cylindrical part, m
s1_1, s1_2	Thickness of bushing conical part, m
Db	Diameter of bolted circle, m

Dn_1, Dn_2	Outside diameter, m
hk_1, hk_2	Free flange thickness, m
h0_1, h0_2	Facet, m
Dk_1, Dk_2	Free flange inside diameter, m
Dnk_1, Dnk_2	Free flange outside diameter, m
Df_1, Df_2	Flange inside diameter, m
R_1, R_2	Spherical radius, m
Py_1, Py_2	Conditional pressure
Dy_1, Dy_2	Nominal diameter
ds_1, ds_2	Internal diameter of adjacent element, m
ss_1, ss_2	Wall thickness of adjacent element, m
r_1, r_2	Spherical radius, m
h1_1, h1_2	Clamp height, m
h2_1, h2_2	Fastener height, m
Dsp1	Mean diameter of gasket between contacting flanges , m
Dsp2	Mean diameter of gasket between contacting flanges , m
bp1	Width of gasket between contacting flanges , m
bp2	Width of gasket between contacting flanges , m
hp1	Thickness of gasket between contacting flanges , m
hp2	Thickness of gasket between contacting flanges , m
Delta_1, Delta_2	Weld cathetus, m
c1_1, c1_2	Corrosion allowance, m
c2_1, c2_2	Negative allowance, m
c3_1, c3_2	Technological allowance, m
D_1, D_2	Inside diameter, m
lc_1, lc_2	Length of bushing cylindrical part, m

Encapsulated object	**Description**
GetMaterial1_APP GetMaterial2_APP	Flange material parameters at calculation according to RD
GetBoltMaterial_APP	Bolt material parameters at calculation according to RD
GetRingMaterial1_APP GetRingMaterial2_APP	Ring material parameters at calculation according to RD
GetMaterial1_ASME GetMaterial2_ASME	Flange material parameters at calculation according to RD
GetBoltMaterial_ASME	Bolt material parameters at calculation according to ASME
GetRingMaterial1_ASME GetRingMaterial2_ASME	Ring material parameters at calculation according to ASME
GetMaterial1_52857 GetMaterial2_52857	Flange material parameters at calculation according to GOST
GetBoltMaterial_52857	Bolt material parameters at calculation according to GOST
GetRingMaterial1_52857 GetRingMaterial2_52857	Ring material parameters at calculation according to GOST
GetMaterial_ss_1 GetMaterial_ss_2	Adjacent element material parameters
GetGasket	Gasket parameters

3.6.12 Nozzle

Parameter	Value
NozzleType	Stub-in type 0 – Not passing without reinforcement 1 – Passing without reinforcement 2 – Not passing with ring 3 – Passing with ring 4 –With ring and inside part 5 – with raised edge 6 – With weld-in toroidal insertion 7 – With weld-in ring
NozzleDisp	Stub-in position 0 – Radial 1 – Vertically welded in (horizontally placed) head 2 – Tangential in cylindrical shell 3 – Displaced 4 – Inclined
NozzleCalcType	Specified stub-in calculation type
l1	Outside part length, m
l3	Inside part length, m
r	Fillet radius, m
s3	Inside part thickness
l2	Ring width, m
s2	Ring thickness, m
Delta	Weld cathetus, m
Delta1	
Delta2	
Lst	Nozzle displacement along parent shell axis, m
Rs	Nozzle displacement from the centre of parent head, m
cs1	Corrosion allowance, m
Fc_WORK, Fl_WORK, Fr_WORK, Mc_WORK, Ml_WORK, Mt_WORK, Fc_TEST, Fl_TEST, Fr_TEST, Mc_TEST, Ml_TEST, Mt_TEST	Loads on nozzle in operating and test conditions
BS5500Calc	Stiffness analysis is required
NozzleSystem	Nozzle coordinates 0 – polar 1 – Cartesian
X0	Nozzle displacement in Cartesian system, m
Y0	
lsm	Axis displacement, m
Teta	Axis displacement angle, rad.
gamma	Axial tilt angle, rad.
omega	Axial rotation angle, rad.
Овальный штуцер	

d2	Minor inside diameter, m
Седловая опора	
GetRing	Stiffening ring properties
SheetPresent	Skid board availability 0 – no 1 – yes
RingPresent	Stiffening ring availability 0 – no 1 – yes
lo	Distance from element edge
delta1	Support spanning angle
delta2	Plate spanning angle
b2	Plate width
b	Support width
s2	Plate thickness
bSaddleCalc	Analysis of support is required
SaddleType	Support type
lp	Support width
ap	Distance between transverse ribs
sp	Thickness of transverse ribs
sp1	Transverse ribs thickness
an	Supporting plate length
bn	Supporting plate width
sn	Supporting plate thickness
bWeld	Weld support 0 – no 1 – yes
H	Support height
Fy	Substitute load on support
Dn	Shell outside diameter
R	Doubling plate radius
sDescr	Description of component at its retrieval from database
sStandart	Name of standard at its retrieval from database
sSheetDescr	Description of doubling plate at its retrieval from database

Encapsulated object	**Description**
GetBeton	Foundation concrete parameters
GetSeam	Support weld parameters
GetShellLocalSeam	Shell weld parameters in stub-in zone
GetRingMaterial	Ring material parameters
GetInnerMaterial	Inside part material parameters

3.6.13 Oval nozzle

Parameter	**Value**
d2	Minor inside diameter, m

3.6.14 Saddle support

Parameter	Value
SheetPresent	Skid board availability 0 – no 1 – yes
RingPresent	Stiffening ring availability 0 – no 1 – yes
lo	Distance from element edge
delta1	Support spanning angle
delta2	Plate spanning angle
b2	Plate width
b	Support width
s2	Plate thickness
bSaddleCalc	Analysis of support is required
SaddleType	Support type
lp	Support width
ap	Distance between transverse ribs
sp	Thickness of transverse ribs
sp1	Transverse ribs thickness
an	Supporting plate length
bn	Supporting plate width
sn	Supporting plate thickness
bWeld	Weld support 0 – no 1 – yes
H	Support height
Fy	Substitute load on support
Dn	Shell outside diameter
R	Doubling plate radius
sDescr	Description of component at its retrieval from database
sStandart	Name of standard at its retrieval from database
sSheetDescr	Description of doubling plate at its retrieval from database

Encapsulated object	Description
GetRing	Stiffening ring properties
GetBeton	Foundation concrete parameters
GetSeam	Support weld parameters

3.6.15 Column support

Parameter	Value
SkirtType	Supporting shell type
D0	Diameter of upper base of supporting shell, m
D1	Diameter of lower base of supporting shell, m
s0	Shell wall thickness, m

h0	Total height of supporting shell, m
n	Number of bolts
Tk	Conical element temperature, oC
hk	Conical part height, m
sk	Conical part thickness, m
c1k	Allowances for conical part thickness, m
c2k	
c3k	
dNominal	Nominal diameter of bolts, m
Db	Diameter of bolted circle, m
IF	Minimum inertia moment of foundation base, m4
AF	Concrete foundation area, m2
Delta	Weld cathetus, m
bAdapterPresent	Availability of transitional area
bSubConstructionPresent	Pedestal availability
Qmin	Minimum reduced loading
Qmax	Maximum reduced loading

Encapsulated object	**Description**
GetSkirtHoles	Parameters of windows
GetSkirtUnit	Mounting assembly parameters
GetBoltMaterial	Anchor bolt material parameters
GetBeton	Foundation concrete parameters
GetGround	Soil parameters
GetMaterial_Cyl	Cylindrical part parameters
GetMaterial_Cone	Conical part parameters
GetSeam_Cyl	Cylindrical part weld parameters
GetSeam_Cone	Conical part weld parameters
GetSubConstruction	Pedestal parameters
GetCyclicCyl	Low-cycle strength calculation parameters of cylindrical part
GetCyclicCone	Low-cycle strength calculation parameters of conical part

3.6.16 Supporting poles

Parameter	**Value**
DelucateMont	Accurate cueing 0 – no 1 – yes
LugType	Type of supporting poles 0 – a, 1 – b, 2 – c, 3 – d
LugsNum	Number of supporting poles
b2	Plate width, m
b3	Doubling plate length, m
b4	Doubling plate length, m
h1	Supporting pole height, m
g	Distance between midlines of ribs, m

s1	Pole wall thickness, m
s2	Doubling plate thickness, m
e1	Distance between force application point and shell or doubling plate, m
l1	Supporting pole length, m
ss	Wall thickness of adjacent element, m
M, M_TEST	Calculation bending moment in operating and test conditions, tm
F, F_TEST	Calculation axial force in operating and test conditions, tf
Teta	Axis positioning angle, rad.
sCase	Version of support

3.6.17 Supporting lugs

Parameter	Value
d1	Lug circumference diameter, m
d2	Lug outside diameter, m
d3	Doubling plate diameter, m
d4	Supporting circle diameter, m
h	Support height, m

3.6.18 Supporting pads

Parameter	Value
b	Support footing length, m
b1	Maximum rib length, m
b2	Distance from centre of bolt holes to the edge of support, m
k	Rib chamfer, m
A	Plate width, m
s3	Rib thickness, m
a	Distance between ribs, m

3.6.19 Stairways

Parameter	Value
Teta	Approach angle, rad.
hDown	Descent length, m
hUp	Lifting length, m
Gl	Weight per unit length, t/m
Width	Width, m
delta	Clearance between stairways and bearing element, m

3.6.20 Packing

Parameter	Value
D1	Diameter, m
h1	Height, m
Gr	Supporting ring weight, tf
ro	Filler density, t/m3

bLicPresent	Liquid is available
ksi1	Liquid fill factor
ro1	Liquid density, t/m3
sStuff	Filler name:

3.6.21 Service platform

Parameter	Value
Teta0	Start angle, rad
Teta1	Start angle, rad
Teta	Rotation angle, if platform is on the head, rad.
Ga	Weight related to area, t/m2
l1	Width 1, m
l2	Width 2, m
h1	Height 1, m
h2	Height 2, m
delta	Clearance between platform and bearing element, m
K_mode	How to calculate a resistance factor 0 - calculation per factor Cf 1- Calculation per area
K	Wind calculation factor
As	Manually calculated drag area
bLadderPresent	Stairways is available

3.6.22 Stiffening ring

Parameter	Value
RingType	Section type 0 – rectangular section 1 – T-type profile 2 – L-type profile 3 – C-type profile, U-section is directed sideward 4 – double tee 5 – angle 6 – U-type profile, U-section is directed downward 0xFF – set by user
RingIOType	Ring positioning 0 – outside 1 – inside
t	Welded section width, m
h	Ring height, m
b4	Ring width, m
s4	Thickness of ring vertical pan, m
s5	Thickness of ring upper pan
s6	Thickness of ring lower pan, m
lo	Distance from element edge, m
Ak	Section area, m2
Ik	Section inertia moment, m4

e	Distance to the centre of gravity, m
Hp	Ring section depth, m
Descr	Section name in database

3.6.23 Reinforcing rib

Parameter	Value
Lp	Rib length

3.6.24 Stiffening ring of saddle support

Parameter	Value
Wp	Plastic section modulus, m3
e4	Distance to the neutral axis of section, m

3.6.25 Tray block

Parameter	Value
n	Number of trays
delta	Distance between trays, m
h	Tray height, m
Gt	Assembled tray weight, t

3.6.26 External loads

Parameter	Value
dx	Weight displacement per X, m
dy	Weight displacement per Y, m
dz	Weight displacement per Z, m
W	Weight, tf
Fx_WORK	(External) loads without allowance for weight in operating conditions
Fy_WORK	
Fz_WORK	
Mx_WORK	
My_WORK	
Mz_WORK	
Fx_TEST	(External) loads without allowance for weight in test conditions
Fy_TEST	
Fz_TEST	
Mx_TEST	
My_TEST	
Mz_TEST	
Fx_MONT	(External) loads without allowance for weight in assembling conditions
Fy_MONT	
Fz_MONT	
Mx_MONT	
My_MONT	
Mz_MONT	
bPresent_MONT	Available in assembling conditions
bPresent_TEST	Available in test conditions
lo	Displacement form element beginning, m

CSType	Directed in coordinate system: 0 – global 1 – local

3.6.27 Weight load

Parameter	Value
CoordSystem	Shall be set in coordinate system: 0 – polar 1 – Cartesian
Rg	Displacement in coordinate system
Teta	Angle in polar coordinate system

3.6.28 Detachable elliptic cover

Parameter	Value
GetFlange	Flange part parameters
hkr	Ring thickness, m
Dn	Ring outside diameter, m

Encapsulated object	Description
GetMaterial_Ak	Ring material parameters
GetSeam_k	Parameters of weld, to which a ring was welded

3.6.29 Detachable flat cover

Parameter	Value
GetFlange	Flange [part parameters
PazPresent	Availability of groove for separating wall 0 – no 1 – yes
s1paz	Cover thickness in the groove place, m
Dn	Ring outside diameter, m

3.6.30 Detachable spherical unbeaded cover

Parameter	Value
hkr	Ring thickness, m
Dn	Ring outside diameter, m

Encapsulated object	Description
GetFlange	Flange part parameters

3.6.31 Heat exchanger

3.6.31.1 Flange joint

Parameter	Value
ConnType	Joint type 0 – welded to the casing 1 – welded to the flange 2 – between two flanges
ConnWeld2CaseType	Type “welded to the casing” 0 – standard 1 – reserved
ConnWeld2FlangeType	Type “welded to the flange” 0 … 5 – flange type
ConnFlangesType	Type “between two flanges” 0 … 2 – flange type

Encapsulated object	Description
GetAdapter	Transitional cylindrical part parameters

3.6.31.2 Floating head

Parameter	Value
FlHeadType	Type 0 – elliptic 1 – spherical unbeaded
e1	Distance from cross point of segment centreline to the ring centre of gravity
R	Head radius
r1	Shoulder of forces effecting on semi-ring
T	Total thickness of semi-ring:
tpk	Minimum section thickness of semi-ring
Teta	Semi-ring groove tilt angle
D2	Groove mean diameter
d0	Bolt hole diameter

Encapsulated object	Description
GetSeam_k	Weld parameters
FlangeBott	Flange part parameters
TubePlate	Pipe grid parameters

3.6.31.3 Heat exchangers with stationary grids

Parameter	Value
t0	Assembling temperature, oC
t	Mean temperature of casing wall, oC
bPlates	Availability of separation walls in shell side

	0 – no 1 – yes
l1R	Maximum pipe distance between grid and separating wall, m
l2R	Maximum pipe distance between separating walls, m

Encapsulated object	Description
Flange1	First flange joint parameters
Flange2	Second flange joint parameters
TubePlate1	First tube plate parameters
TubePlate2	Second tube plate parameters
TubeBundle	Tube bundle parameters
Casing	Casing parameters

3.6.31.4 Heat exchangers with stationary grids with expanders

Encapsulated object	Description
Expander	Expander parameters

3.6.31.5 Heat exchangers with stationary grids with expansion joints

Encapsulated object	Description
Sylphon	Expansion joint parameters

3.6.31.6 Heat exchangers with U-shaped pipes

Parameter	Value
bDirection	Direction, to which end the flange is welded 0 - right 1 – left

Encapsulated object	Description
Flange	Flange joint parameters
TubePlate	Pipe grid parameters

3.6.31.7 Heat exchangers with stationary grids with floating heads

Encapsulated object	Description
FlHead	Floating head parameters

3.6.31.8 Expander

Parameter	Value
Lp0	Distance to the beginning of casing
lp	Transitional part length
Lp	Cylindrical part length

Dp	Maximum inside diameter
spac	Expander wall thickness
beta0	Wall deviation angle

3.6.31.9 Expansion joint

Parameter	Value
Lk	Distance from the beginning of casing
rk	Curve radius
Dk	Maximum inside diameter
dk	Minimum inside diameter
sk	Expansion joint wall thickness
n	Number of sections
ConnType	Junction type
lk	Cylindrical part length
qk	Length of one section
Deltak	Weld cathetus
SeamProc	Weld processing
SeamPos	Weld position

3.6.31.10 Separating wall

Parameter	Value
Deltap	Pressure loss
h	Separating wall displacement from coordinate origin
bnep	Separating wall width
Lnep	Separating wall length

3.6.31.11 Tube bundle

Parameter	Value
BundleType	Position of holes in tube sheet 0 – 90 degrees 1 – 60 degrees 2 – 45 degrees 3 – set by user
tp	Hole interval
tn	Distance between rows of holes
d0	Tube sheet hole diameter
dT	Tube outside diameter
sT	Tube wall thickness
h1	Upper segment height
h2	Lower segment height
n	Number of holes
i	Number of tubes
R	Maximum radius of tube zone
bOffset	Displacement
a1	Distance from the casing axis to the most distant tube

DE	Diameter of the circle inscribed in maximum tubeless area
It	Equivalent inertia moment of tube bundle at curve

3.6.31.12 Tube bundle of unit with stationary grids

Parameter	Value
tT	Mean temperature of tubes

3.6.31.13 Tube bundle of unit with U-shaped tubes

Parameter	Value
l	Tube length
bSpecialReq	Specific requirements to flexure 0 – no 1 – yes

3.6.31.14 Tube sheet

Parameter	Value
s1p	Tube sheet minimum thickness
spn	Tube sheet thinned part thickness
DB	Tube sheet thickened part diameter
bSlotPresent	Separating wall groove availability
sn	Tube sheet thickness in the groove place
bn	Groove width
Dp	Tube sheet diameter

3.6.31.15 Stationary tube sheet

Parameter	Value
TubeFixingType	Type of tube holders in the sheet
lb	Expander length
qDop	Allowable specific load
bWelding	With welding 0 – no 1 – yes
Delta	Weld cathetus

3.6.31.16 Tube sheet of unit with U-shaped tubes

Parameter	Value
TubeFixingTypeU	Tube position type

3.6.31.17 Cylindrical jacket

Parameter	Value
JacketType	Jacket conjunction type 0 – Using cone 1 – Without cone
JacketCylVersion	Conjunction configuration

D2	Jacket inside diameter, m
s2	Jacket wall thickness, m
l	Jacket length, m
lp	Jacket transitional area length, m
r0	Jacket bead radius, m
h0	Jacket ring thickness, m
b0	Jacket ring width, m
a	Weld cathetus, m
bSylphonPresent	Expansion joint availability 0 – no 1 – yes
Tcp	Mean temperature of vessel wall, oC
Tcp2	Mean temperature of jacket wall, oC

Encapsulated object	Description
Jacket	Jacket shell parameters
GetMaterialRing	Ring material parameters
GetRingSeam	Ring weld parameters
Sylphon	Expansion joint parameters

3.6.31.18 U-shape jacket

Parameter	Value
d1	Central zone diameter, m
bSpiralPresent	Guide spiral availability

Encapsulated object	Description
JacketCyl	Jacket shell parameters
VesselCyl	Vessel shell parameters
JacketBottom	Jacket head parameters
VesselBottom	Vessel head parameters
Spiral	Guide spiral parameters
GetMaterialRing	Ring material parameters
GetRingSeam	Ring weld parameters

3.6.31.19 Spiral

Parameter	Value
a	Weld cathetus, m
ts	Spiral pitch, m
n	Number of coils

3.6.31.20 U-shaped jacket head

Encapsulated object	Description
Ellip	Elliptic head parameters
Torus	Torispherical head parameters

Sph	Spherical head parameters
SphBead	Spherical unbeaded head parameters

3.6.31.21 Jacket with coiled or register channels

Encapsulated object	Description
SpiralCoil	Coiled channel parameters
NozzleCoil1	Parameters of first nozzle of coiled channel
NozzleCoil2	Parameters of second nozzle of coiled channel

3.6.31.22 Coiled or register channel

Parameter	Value
cs1	Corrosion allowance, m
cs2	Negative allowance, m
cs3	Technological allowance, m
CoilType	Channel version
r2	Outside section radius, m
s2	Channel wall thickness, m
gamma	Half central angle, rad.
n3	Number of closures

3.6.31.23 Jacket partly covering the vessel

Parameter	Value
deltaT	Circular angular pitch, rad.
deltaK	Angular pitch to the first row of junctions, rad.
deltaD	Angular pitch of junctions on the head, rad.
psi	Half jacket-covering angle, rad.
nC	Number of junctions along the circle
nL	Number of junctions along the axis
tL	Distance along the axis to the first row of junctions, m
tP	Pitch of joints along the axis, m
R2	Curve radius on head top, m
s3	Wall thickness, m
H2	Head height, m
d0	Raised edge or anchor tube outside diameter, m
s0	Slave thickness of anchor tube wall, m
r1	Inside curve radius of raised edge, m

Encapsulated object	Description
GetMaterialConn	Connection material parameters
GetSeamConn	Connection weld parameters

3.6.31.24 Bend

Parameter	Value
OutletType	Bend type, m

R	Bend radius, m
Alpha	Angle alpha, rad.
gamma	Angle gamma, rad.

3.7 Encapsulated objects

3.7.1 Low-cycle strength analysis data

<Object name="GetCyclic">

Parameter	Value
DeltaTTj0	Amplitude of temperature difference of two neighbouring points on the vessel wall
DeltaTaj0	Amplitude of calculation temperatures in junction points between two materials, with different linear expansion coefficients
Deltapj0	Operating pressure amplitude
DeltaFj0	Force amplitude
DeltaMj0	Bending moment amplitude
DeltaM1j0	Bending moment amplitude
delta	Edge displacement
r	Transition outside radius
ElemType	Assembly or element of vessel 0 – Smooth shell (shell) 1 – Spherical part of dished heads without holes (shell) 2 – Reinforcing pads (shell) 3 – Weld edge displacement (shell) 4 – Junction of shells with different thickness (thinner shell) 5 – Flat head or cover without holes (flat head, cover) 6 – Elliptic head (head) 7 – Studs, Rm < 540 MPa (thread) 8 – Butt welding of flange with smooth transition"(casing and flange) 9 – Shell with stiffening ring (shell) 10 – Raised part of torispherical head and conical shell (toroidal transition) 11 – Raised flat conical head (casing) 12 – Conical head without transition (casing) 13 – Raised part of torispherical and conical heads (junction point between head and shell) 14 – Flat head or cover with hole, tube sheet (head, cover, tube sheet) 15 – Raised nozzles and access holes (shell in the place of installation of nozzle or access hole) 16 – Casing with nozzle without coupling ring (casing in the place of nozzle installation) 17 – Connection between conical shell and cylindrical shell of fewer diameter (conical transition) 18 – Plane flanges welded to the casing (casing and flange) 19 – Bolts, Rm < 540 MPa (thread) 20 – Casing with nozzle without coupling ring (casing in the place of nozzle installation) 21 – Corner welds of conical or spherical shell (transition)

	22 — Connection between unbeaded conical shell and cylindrical shell (the junction of shells) 23 – Bolts and studs, Rm < 540 MPa (thread) 24 – Spherical cover with ring (spherical segment) 25 – Connection with shell of raised or grooved flat head (cylindrical shell and flat head without hole; element with lower allowable pressure prevails) 26 – Connection with shell of welded flat heads of other types (cylindrical shell and flat head without hole; element with lower allowable pressure prevails)
SeamType	Weld type or element connection 0 – Butt welds with full penetration and smooth transition 1 – T-butt welds with full penetration and smooth transition 2 – Seamless shell 3 – Vessel welds with skid board throughout the length 4 – Butt welds and T-welds with full penetration without smooth transition 5 – Nozzle welds with reinforcing ring with full penetration 6 – Reinforced butt weld 7 – Single-sided welds without skid board, with lack of penetration in the roots 8 – Nozzle welds with constructive clearance 9 – Welds of skid boards 10 – Welds of nozzles with reinforcing ring and constructive clearance 11 – Welds of flat welded flanges with constructive clearance 12 – Welds of welded flat heads 13 – Weld with displacement as per as per GOST R 52857.11-2007
SeamProc	Weld processing 0 – Polished 1 – Unprocessed
__TempNear	Adjacent element: temperature
__sNear	Adjacent element wall thickness

3.7.2 Insulation parameters

<Object name="GetInsulation">

Parameter	Value
Name	Material name
ro	Material density
s	Material thickness

3.7.3 Lining parameters

<Object name="GetLining">

Parameter	Value
Name	Material name
Ro	Material density
S	Material thickness

3.7.4 Material parameters

<Object name="GetMaterial">

Parameter	Value
A	Low-cycle strength calculation factor, tf/m2
B	Low-cycle strength calculation factor, tf/m2
Ct	Low-cycle strength calculation factor
Alpha	Linear expansion coefficient 1/oC
CastIronControl	Iron properties as per GOST 26159-84
CastIronGraphite	
CastIronLoadType	
CastIronThermal	
E	Modulus of longitudinal elasticity at calculation temperature, tf/m2
E20	Modulus of longitudinal elasticity at 20 oC, tf/m2
ListGroup	Sheet grade (strength group)
MaterialType	Material type
Otlivka	Casting control
Re	Yield point at calculation temperature, tf/m2
Re20	Yield point at 20 oC, tf/m2
Rm	Strength limit at calculation temperature, tf/m2
Rm20	Strength limit at 20 oC, tf/m2
Resource	Not used
Rm105	Long-term strength, tf/m2
Rp02Used	Rp0.2 instead of Rp1.0.
Rp105	Creep limit
SgmDop	Allowable stresses at calculation temperature, tf/m2
SgmDop20	Allowable stresses at 20 oC, tf/m2
SteelClass	Steel class
TABLE_<Param>_T<Temp>	Table value of parameter <Param> at temperature <Temp>
TypeZagot	Workpiece type
UserDefFlag	Feature indicating that the material has been defined by user 1 – yes 0 – no –1 – not specified
mu	Poison's ratio
ro	Density, t/m3
sSteelName	Material name

3.7.5 Weld parameters

<Object name="GetSeam">

Parameter	Value
Control100	100 length control 0 – no 1 – yes
Fi	Strength ratio
SeamType	Type as per GOST 52857.1

sSeamType	Type name

3.7.6 Gasket material parameters

<Object name="GetRubber">

Parameter	Value
sRubberName	Material name
Ep	Conditional compression modulus tf/m^2
K	Compression modulus
q	Allowable specific pressure, tf/m^2
q0	Specific swaging pressure, tf/m^2
m	Factor

3.7.7 Concrete parameters

<Object name="GetBeton">

Parameter	Value
sBetonClass	Concrete class
SgmDop	Allowable pressure, tf/m^2

3.7.8 Soil parameters

<Object name="GetGround">

Parameter	Value
sGroundType	Soil name
GroundType	Soil type index
CF	Compression irregularity coefficient

3.7.9 Gasket parameters

<Object name="GetGasket">

Parameter	Value
RubVersion	Gasket version 0 – Version A 1 – Version B 2 – Version C 3 – Version D 4 – Version E 5 – Octal gasket
Dpn	Gasket outside diameter
hp	Gasket thickness
Dpv	Gasket inside diameter
Dsp	Gasket mean diameter
bp	Gasket width
Dsp1	First mean diameter of gasket for contacting flanges
Dsp2	Second mean diameter of gasket for contacting flanges
hp1	First thickness of gasket for contacting flanges
hp2	Second thickness of gasket for contacting flanges

bp1	First width of gasket for contacting flanges
bp2	Second width of gasket for contacting flanges
Standart	GOST, according to which a gasket has been selected
Version	Selected version
Pu	Conditional pressure
Du	Nominal diameter
Array	Spiral-wound gasket as per GOST
Thick	Spiral-wound gasket thickness as per GOST

Encapsulated object	Description
GetRubber	Material parameters

3.7.10 Supporting shell window parameters

<Object name="GetSkirtHoles">

Parameter	Value
n	Quantity
hName<n>	Window indication <n>
hd<n>	Distance from foundation, m
d<n>	Inside diameter, m
sd<n>	Wall thickness, m
hc<n>	Height, m
teta<n>	Angular position, rad.
l1<n>	Outside part length, m
l3<n>	Inside part length, m

3.7.11 Supporting shell assembly parameters

<Object name="GetSkirtUnit">

Parameter	Value
SkirtUnitType	Assembly type
Delta1	Weld thickness in weld point of supporting shell, m
s1	Executive thickness of lower supporting ring, m
s2	Executive thickness of upper supporting ring, m
s4	Rib executive thickness, m
b1	Width of lower supporting ring, m
b2	Extending width of lower supporting ring, m
b3	Length of upper supporting ring, m
b4	Width of upper supporting ring, m
b5	Minimum distance between two adjacent ribs, m
h	Height of supporting assembly, m
InfPlatePresent	Availability of reinforcing plate, m
s3	Reinforcing plate thickness, m
b7	Reinforcing plate width, m

3.7.12 Pedestal parameters

<Object name="GetSubConstruction">

Parameter	Value
PolesType	Parallel or slant legs 0 – cylindrical shell 1 – conical shell 2 – parallel legs 3 – slant legs
substructureHeight	Structure height
DiamBottom	Bottom circumscribed circle diameter
DiamTop	Top circumscribed circle diameter
Thick	Wall thickness, if supporting shell
FillType	Side edge fill type
columnNumber	Column number
tiesInEachSide	Ties alternate next to one edge
bUnit	Integration of braces in the centre
tiesQuantity	Quantity of ties
Level1	First belt level
Level2	Last belt level
bPlateUpper	Upper plate
PlateUpperType	Upper plate type 0 – round 1 – square
PlateA	Square plate side, m
PlateD	Round plate diameter, m
Plated1	Internal opening diameter, m
Plateh	Plate thickness, m
Platero	Plate material density, t/m3
Orient_X_Support	Support axis orientation 0 – normal 1 - tangential 2 - along X axis glob.— only for vertical supports 3 - along Y axis glob.— only for vertical supports
Orient_X_Brace	Brace axis orientation 0 – normal 1 – tangential
Orient_X_Girder	Girder axis orientation 0 – normal 1 – tangential 2 – horizontal 3 – vertical
bUserSize	Number of elements set by user
ElementSize	Method of element quantity setting
NElements	Number of elements
LElements	Element average length

Encapsulated object	Description
GetSection_Support	Support section parameters
GetSection_Girder	Girder section parameters
GetSection_Brace	Brace section parameters
GetMaterial_Support	Support material parameters
GetMaterial_Girder	Girder material parameters
GetMaterial_Brace	Brace material parameters

3.7.13 Section parameters

<Object name="GetSection_XXX">

Parameter	Value
StandartName	Standard name
Descr	Section name per standard
section_type	Section type -1 – not specified 0 – Circle 1 – Rectangle 2 – Pipe 3 – Square pipe 4 – Square pipe 5 – double tee 6 – Double tee with parallel faces 7 – Equal channel 8 – Unequal channel 9 – Equal angle 10 – Unequal angle 11 – Square 12 – T beam 0xFF – Set by user
UserDef	Method of section setting 0 – as per standard 1 – set by user
UserName	User name
h	Height, m
b	Width, m
F	Cross section area, m2
W	Weight 1 m, t
Jx	Inertia moment around X axis, m4
Wx	Resisting moment around X axis, m3
ix	Inertia radius around X axis, m
Sx	Half-section static moment, m3
Jy	Inertia moment around Y axis , m4
Wy	Resisting moment around Y axis , m3
iy	Inertia radius around Y axis, m
Sy	Half-section static moment, m3
x0	Distance from y - y axis to the wall outer surface, m

y0	Distance from x - x axis to the wall outer surface, m
s	Wall thickness, m
t	Pan thickness, m
d	Diameter, m
a	Side, m
b1	Pan width, m

3.7.14 Girder material parameters

<Object name="GetMaterial_XXX">

Parameter	Value
StructMaterialType	Material type 0 – steel 1 – concrete
Ry	Calculation resistance, tf/m^2
Ru	Calculation resistance, tf/m^2
bControl	Quality control as per GOST 27772 0 – no 1 – yes
BetonClass_t	Concrete class per axial tension strength
BetonClass_F	Concrete freezing resistance grade
BetonClass_W	Concrete water resistance grade
Rbn	Concrete axial compression resistance
Rbtn	Concrete axial tension resistance

3.8 Element type identification

ID	VALUE
1000	CYLINDRICAL SHELL
2000	CONICAL SHELL
3000	ELLIPTIC HEAD
4000	SPHERICAL HEAD
5000	TORIC HEAD
6000	FLAT CONICAL HEAD
7000	FLAT WELDED HEAD/COVER
8000	NOZZLE
8100	OVAL NOZZLE
9000	SADDLE SUPPORT
10000	SHELL STIFFENING RING
10500	RING IN SADDLE SUPPORT
11000	EDGE REINFORCING ELEMENT OF CONICAL SHELL
12000	SPHERICAL UNBEADED COVER/HEAD
14000	GASKET
15000	STEEP CONICAL HEAD
16000	SUPPORTING POLES
17000	SUPPORTING LUGS

18000	FLANGE
19000	REINFORCING RIB
20000	RIBBED FLAT HEAD/COVER WITH CENTRLA BUSHING
21000	SUPPORTING POLES
9100	SKID BOARD OF SADDLE SUPPORT
13100	RESTRAINT
22000	LOADS ON THE VESSEL
22100	LOADS ON VESSEL — CUT VERSION FOR HORIZONTAL VESSELS
23000	WEIGHT ELEMENT
23100	CUT VERSION OF WEIGHT ELEMENT FOR HORIZONTAL VESSELS
24000	STAIRWAYS
25000	SERVICE PLATFORM
26000	PACKING
27000	TRAY BLOCK
24100	INSULATION
24200	LINING
28000	SUPPORTING SKIRT
28100	GROUP OF WINDOWS IN SUPPORTING SKIRT
28200	SUPPORTING ASSEMBLY IN THE SKIRT
28300	COLUMN FOUNDATION
28400	TRANSITIONAL SHELL
18100	FLANGE WITHIN THE HEAD —FOR DETACHABLE HEADS
29000	DETACHABLE ELLIPTIC HEAD
31000	DETACHABLE Flat bottom (manway)
32000	DETACHABLE HEMISPHERICAL UNBEADED COVER
40000	HEAT EXCHANGER
41000	HEAT EXCHANGERS WITH STATIONARY TUBE SHEETS
42000	HEAT EXCHANGERS WITH STATIONARY TUBE SHEETS, WITH BELLOWS
43000	HEAT EXCHANGER WITH STATIONARY TUBE SHEETS, WITH EXPANSION JOINT.
44000	HEAT EXCHANGERS WITH U-SHAPED PIPES
45000	HEAT EXCHANGER WITH FLOATING HEAD
50100	BELLOWS
50200	EXPANDER
60000	TUBE SHEET PLATE
61000	TUBE BUNDLE
62000	TUBE SHEET FLANGE
63000	CASING
64000	SEPARATING WALL
65000	FLOATING HEAD
70000	BEND

70900	JACKET
71000	CYLINDRICAL JACKET
72000	U-SHAPE JACKET
72100	JACKET HEAD
72200	JACKET SPIRAL
72300	COILED CHANNEL SPIRAL
72400	REGISTER CHANNEL
73000	JACKET PARTLY ENVELOPING THE VESSEL
75000	JACKET WITH COILED CHANNELS
76000	JACKET WITH REGISTER CHANNELS
77000	CARRYING OYLET

4 Attachment. XML file example

You can find below an example of XML file describing horizontal vessel comprising a flat head.

```
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        <Param name="Corrosion">1</Param>
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        <Param name="D2">0.0</Param>
        <Param name="D3">0.0</Param>
        <Param name="Dsp">0.0</Param>
        <Param name="Envir">0</Param>
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        <Param name="Fbm_TEST">0.0</Param>
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          <Param name="Alpha">0.0</Param>
          <Param name="B">0.0</Param>
          <Param name="CastIronControl">0</Param>
          <Param name="CastIronGraphite">0</Param>
          <Param name="CastIronLoadType">0</Param>
          <Param name="CastIronThermal">0</Param>
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          <Param name="Re">0.0</Param>
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          <Param name="SgmDop">0.0</Param>
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          <Param name="SteelClass">0</Param>
          <Param name="TypeZagot">0</Param>
          <Param name="UserDefFlag">0</Param>
          <Param name="mu">0.3</Param>
          <Param name="ro">7.8</Param>
          <Param name="sSteelName">Ст3</Param>
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          <Param name="Fi">1.0</Param>
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          <Param name="sSeamType">Butt weld or T-butt weld with bilateral solid penetration,
automatic</Param>
        </Object>
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        <Param name="Hlwork.corr.">0.0</Param>
        <Param name="Hlwork.no corr.">0.0</Param>
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        <Param name="ID_Next">0</Param>
        <Param name="ID_Parent">0</Param>
        <Param name="ID_Prev">0</Param>
        <Param name="InsPresent">0</Param>
        <Param name="Label">-</Param>
```

```
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        <Param name="Name">Flat head(cover) №1</Param>
        <Param name="NameOfFluid">glycols</Param>
        <Param name="Name_Parent">-</Param>
        <Param name="Norm">1</Param>
        <Param name="Pouring">1</Param>
        <Param name="Ptest">0.0</Param>
        <Param name="Temp">20.0</Param>
        <Param name="Type">7000</Param>
        <Param name="a">0.02</Param>
        <Param name="c1">0.003</Param>
        <Param name="c2">0.0008</Param>
        <Param name="c3">0.0</Param>
        <Param name="h1">0.1</Param>
        <Param name="ksi">0.05</Param>
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        <Param name="s2">0.0</Param>
        <Param name="s3">0.0</Param>
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