LLC "Chromos"

User's Guide

"CHROMOS PGC-1000" Software

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Introduction

This user's guide describes the operation with the integrated software "CHROMOS PGC-1000" (hereinafter referred to as the software) intended to control chromatograph "Chromos PGC-1000" (hereinafter referred to as the chromatograph) and to process chromatographic data, keep the database for all analyzes.

The metrologically significant part of the integrated software allows to verify the acceptability of chromatographic data and calculate a molar fraction of natural gas components in accordance with GOST 31371.7-2008, as well as to calculate the physical and chemical parameters of natural gas on their basis according to GOST 31369-2008.

The metrologically insignificant part of the integrated software allows to control the chromatograph and external components, obtain, identify and interpret chromatographic data, to adjust the chromatograph operation mode in accordance with GOST 31371-2008, and to communicate with external devices.

Persons who have studied this user's guide, who have computer Internet browsers skills may operate the software. Each user must have the necessary knowledge in the subject field for proper operation with the data to be provided.

1 Preparation for operation

1.1 Connection methods

The chromatograph has communication channels via serial RS-485 interface and the Ethernet network.

Modbus TCP protocols are supported on the Ethernet network (the port is set in the software settings (item 4.2) and HTTP (port 80) – the Web interface.

Serial RS-485 interface provides supporting the Modbus RTU connection, the relevant parameters are set in the software settings (item 4.2).

1.2 Minimum system requirements for PC

To view and process chromatographic data, a remote personal computer (PC) may be used. Minimum system requirements for PC:

- Compatibility with IBM PC;
- Pentium IV processor;
- CD drive;
- 1280x1024 screen;
- 1 GB RAM;
- Mouse and keyboard;
- Windows operating system.

1.3 Startup of the "CHROMOS PGC-1000" software over Ethernet

When operating the "CHROMOS PGC-1000" software over Ethernet, the following procedures shall be performed at the user's workplace:

- 1. Start up one of the supported browsers (Internet Explorer, Google Chrome, Mozilla Firefox).
- 2. Specify the chromatograph network address in the browser's address bar and click the navigation button.
- 3. Enter the login and password in the form of authentication. Click the "Sign in" button (Figure 1).

Sign in		
Login		
Password		
	Sign in	

Figure 1 – Sign in

4. The user will go to the home page of the "CHROMOS PGC-1000" software (Figure 2).

Home – WebConsole ×	
\rightarrow C (i) localhost:47959	о т ф
Measurements Archive Settings Users Abo	ut admin Sign out
Update	
	Last update time: 6/7/2018 8:47:16 AM
Instrument operation mode:	
Name	Value
Analysis date	2/7/2018 4:19:44 PM
Analysis type	Analysis
Calibration	Details
Atmosphere pressure	1.2
Components	

Figure 2 – Home page of the "CHROMOS PGC-1000" software

If the "CHROMOS PGC-1000" application does not start, please contact the User Support Service.

2 Chromatograph control

To control the chromatograph an integrated computer is used that allows the user to adjust the operating parameters in accordance with the specific process conditions. The chromatograph is controlled using the mouse mounted directly on the instrument. A measurement result is displayed on the instrument and can be transferred to the control system.

The chromatograph is automatically controlled in accordance with the software settings. Reference and sampled gas flows are automatically calibrated and changed over at the preset time (see item 4.3)

The analysis conditions, chromatograph assemblies temperature, carrier-gas flow rate and valves switching time are set by the manufacturer, contained in predefined methods and cannot be changed by the user.

3 Operations description

3.1 Authorization

For authentication in the application, the user shall enter the login and password (Figure 3).

Sign in – WebConsole X		
← → C (i) localhost:47959/Account/Login		☆
n Measurements About		Sign in
	Cian in	
	sign in	
	Login	
	Password	
	Sign in	
ХРОМОС		

Figure 3 – Authorization

The following is set by default:

- login: admin;
- password: password.

It is recommended to change them when the program is firstly start up. To do this, sign in and click the Login button from the main menu. Now the form of password change is available (Figure 4). Enter the current password and new one doubly to exclude the invalid password entry.

Account Management - 1 ×		
→ C 🛈 localhost:47959/Account	Manage	\$
A Measurements Archive	Settings Users About	admin Sign out
Account Manager	nent	
Signed in as admin .		
Form of password change		
Current password		
New password		
Confirm new password		
	Password change	
XPOMOC		

Figure 4 – Form of password change

3.2 New user registration

To register a new user, go to the user and access management page. Select the [Users] tab from the main menu (Figure 5) \rightarrow click the [Create a New User] button (Figure 6), then enter the login and password (the password shall be of at least 6 characters), specify the user role on the next page (Figure 7).

Users – WebConsole	×	
\rightarrow C (i) localh	ost:47959/Account	\$
f Measureme	ents Archive Settings Users About	admin Sign ou
Users		
Create a new use	er	
Login	Roles	
admin	admin	Change Delete
Page 1 of 1		
		1
XPOMOC		

Figure 5 – Users

The software implements three types of roles: "guest", "operator" and "administrator". The "guest" role is used for all unauthorized users, they have the right only to view logs of measurement, calibrations and errors, with no right to make any changes. A user with the "operator" role can view all the logs and generate reports, but has no access to the software settings. The user having the "administrator" rights can view, generate all reports and make the necessary changes to the program settings.

Registration - WebConso X		
← → C () localhost:47959/Account	Create	☆ :
Archive Measurements Archive	Settings Users About	admin Sign out
Registration		
Login		
Password		
Confirm password		
	Registration	
Cancel		
XPOMOC		

Figure 6 – Users. Registration

C Edit – WebConsole X		
$\dot{\mathbf{C}} \rightarrow \mathbf{C}$ (i) localhost:47959/Account/	Edit/51e7651f-83c3-4e0b-a7ee-ad605eda0f5e	☆
Archive Measurements Archive	Settings Users About	admin Sign out
Edit		
Login	admin	
Roles	admin	-
Password reset	Change	
	Save Delete	
Back to List		
хромос		

Figure 7 – Users. Edit

3.3 Status view

On the main page (Figure 8) the chromatograph status and the last analysis are displayed. The data are automatically updated every 5 seconds; click the [Update] button to request the latest data.

Home – WebConsole ×									8	
\rightarrow C (i) localhost:479	59									☆
A Measurements	Archive	Settings	Users	About				adr	nin	Sign out
Update										
							Last update	time: 6/7/2	018 9:	06:15 AM
Instrument operation mod	de:									
Name						Value				
Analysis date						2/7/2018 4	19:44 PM			
Analysis type						Analysis				
Calibration						Details				
Atmosphere pressure						1.2				
Components										

Figure 8 – Status

3.4 Operation logs

To view the Operation Logs, select [Archive] from the main menu, then select the corresponding item from the left menu of the program (Figure 9).

Measurements	Archive	Settings Users About	admin Sign o
General	>	Obverse la v file	
Chromos log file	>	Chromos log file	
Bot log file	>	File News	
Web log file	>		
Errors	>	Chromos.log	Details Download
		Page 1 of 1	

Figure 9 – Log file

A list of logs (including the archived ones) of the selected application is available for the user in the page.

- "File name" log file name;
- "Details" file viewing;
- "Download" file saving.

After selecting [Details], one can see the log data, view this file, and save it as a text file (Figure 10).

→ C (i) localhost:	×	re/LogFileDetails?log=Web&name=current.log	
Measurements	Archive	Settings Users About admin	Sign out
General	>	Deteile	
Chromos log file	>	Details	
Bot log file	>		
Web log file	>	File Name current.log	
Errors	>	Viewing	
		2017-07-05 09:30:40.2/52 Into GET: ArchiveErrorMessage [admin: ::1] /Archive/ErrorMes 2017-07-05 09:31:43.4012 Info GET: ArchiveLogFilesOt [admin: ::1] /Archive/LogFiles 2017-07-05 09:31:48.1167 Info GET: ArchiveLogFileDetails [admin: ::1] /Archive/LogFile 2017-07-05 09:33:33.3380 Info GET: SettingsIndex [admin: ::1] /Settings 2017-07-05 09:33:42.7720 Info POST: SettingsButtonAction [admin: ::1] /Settings/Button 2017-07-05 09:33:42.7720 Info POST: SettingsButtonAction [admin: ::1] /Settings/Button 2017-07-05 09:33:42.8032 Info GET: SettingsIndex [admin: ::1] /Settings/Button 2017-07-05 09:33:42.8032 Info GET: SettingsIndex [admin: ::1] /Settings/Button 2017-07-05 09:35:57.4103 Info Application Start 2017-07-05 09:49:10.6037 Info Application Start 2017-07-05 09:49:10.6037 Info Application Start 2017-07-05 09:49:13.5287 Info Application Start 2017-07-05 09:49:13.5287 Info Application Start 2017-07-05 09:49:140.1740 Info Application Start 2017-07-05 09:49:140.1740 Info Application Start	Bot LeDet MActionAct
		2017-07-05 10:04:50.1/40 Info GET: ArchiveLogFilesDownload [admin: ::1] /Archive/LogFilesD	Bot Files

Figure 10 – Log file. Details

3.5 Error message log

To view the error message log, select [Archive] \rightarrow [Errors] (Figure 11). The following information will be available for the user:

- "Date" error date;
- "Type" error type;
- "Code" error code;
- "Message" error description.

Errors – WebConsole	× C	e/ErrorMessage					☆
Measurements	Archive	Settings Users About				admin	Sign out
General	>	Errors					
Chromos log file	>	EITOIS					
Bot log file	>	Date	Type	Code	Message		
Web log file	>		iype	oue	message		
Errors	>	2/9/2018 1:45:19 PM	Automation	3	System abnormal end		
		2/9/2018 1:40:15 PM	Automation	3	System abnormal end		
		2/7/2018 11:28:14 AM	Chromos	1	Overheating		
		2/7/2018 10:31:07 AM	Automation	3	System abnormal end		
		2/7/2018 10:25:45 AM	Automation	3	System abnormal end		
		11/13/2017 10:20:39 AM	Automation	3	System abnormal end		
		7/5/2017 9:49:10 AM	Automation	3	System abnormal end		
		7/5/2017 9:35:57 AM	Automation	3	System abnormal end		
		7/4/2017 2:27:53 PM	Automation	3	System abnormal end		
		7/4/2017 2:21:33 PM	Automation	3	System abnormal end		

Figure 11 – Errors

3.6 Physical and chemical parameters (FCP) calculation setting

The "CHROMOS PGC-1000" software allows taking into account a molar fraction of components not detected with chromatograph "Chromos PGC-1000" and accepted as conditional-constant. A number of conditional-constant parameter components is unlimited.

To specify the conditional-constant components involved in the calculation, select [Settings] → [Calculation] (Figure 12). The table "Components" containing the following data will appear:

• "External component" – a name of conditional-constant component. Any of the components can be selected as a conditional-constant one;

•	"Content (mol,	, %)" – a molai	fraction of the e	external component i	in percentage.

Calculation - WebConsol	×					2.
→ C i localhost:4	17959/Settin	gs/Calc			☆	
Measurements	Archive	Settings Users Ab	out	admin	Sign out	
General	>	Colculation				
Console	>	Calculation				
Modbus	>	Mothana by difforance				
Calculation	>	Methane by difference				
Startup	>	Combustion temperature	20°C		•	
Calibration gases	>	Measurement	20°C		•	
Operation logs	>	temperature				
Scheduler	>	Calculated time	00:00:00		G	
Reports	>	Atmospheric pressure correction				
			Save			
		Component				
		Add component				
		External Component	Concentration (mol%)			

Figure 12 – *Calculation*

To add a conditional-constant component, select [Add component] and in the opened page (Figure 13) specify the component name from the drop-down list and its molar fraction content in percentage.

General	>	Add external	component	
Console	>		component	
Modbus	>	External Component	1.2 Butadiana	
Calculation	>	External component	1.2-Dutduiene	
Startup	>	Concentration (mol%)	0	~ ~
Calibration gases	>		Component concentration indicated in mole percentage	
Operation logs	>		Save	
Scheduler	>	Cancol		
Reports	>	Calicer		
-				

Figure 13 – Calculation Add an external component

To change the conditional-constant component content, select [Change] (Figure 14) opposite to it and specify a new molar fraction content in percentage in the opened page (Figure 15).

To delete a conditional-constant component, select [Delete] (Figure 14) opposite to it and confirm the action in the opened page (Figure 16).

Calculation	>			,
Startup	>	Combustion temperature	20°C	•
Calibration gases	>	Measurement	20°C	•
Operation logs	>	temperature		
Scheduler	>	Calculated time	00:00:00	O
Reports	>	Atmospheric pressure		
		conection	Cava	
			Save	
		Component		
		Add component		
		External Component	Concentration (mol%)	
		Water	0.8	Change Delete

Figure 14 – Calculation. Components

General	>	Change exte	rnal component	
Console	>	Change exte	inal component	
Modbus	>	Concentration (mol%)		
Calculation	>	concentration (mor/»)	0.8 Component concentration indicated in mole percentage	
Startup	>			
Calibration gases	>		Save	
Operation logs	>	Cancel		
Scheduler	>			
Reports	>			
-				

Figure 15 – Calculation. Change external component

Console fodbus	>	Delete external component
lodbus		
	1	Delete external component?
alculation	>	
startup	>	Cancel Delete
alibration gases	>	
peration logs	>	
Scheduler	>	
≀eports	>	

Figure 16 – Calculation. Delete external component

The molar fraction of conditional-constant components is set equal to the values indicated in the calculation settings.

To select a method for methane calculation, tick the "Methane by difference" item for calculation by difference or uncheck for calculation by analysis (Figure 12).

The standard combustion temperatures and measurements are selected from the drop-down lists of discrete values. The standard combustion temperature can be set to: 0, 15, 20, and 25 °C. The standard measurement temperature can be set to: 0, 15, and 20 °C.

To adjust the components content by atmospheric pressure, tick the "Atmospheric pressure correction".

3.7 Measurements log

To view the measurement log, select [Measurements] from the main menu (Figure 17). The following information will be available for the user:

- "Analysis date" analysis date;
- "Analysis type" possible values "Calibration" or "Analysis".

🗘 Analyses – WebConsole	×			
ightarrow $ ightarrow$ $ ig$	17959/Analy:	zes		☆ :
f Measurements	Archive	Settings Users About		admin Sign out
Analyses	>	Apolycoc		
Calibrations	>	Analyses		
Average values	>			
Report	>	from 10/01/2017 12:00:00 AM	to 6/7/2018 9:29:00 AM	Apply
Shewhart chart	>			
Trends	>	Analysis date	Analysis type	
		2/7/2018 4:19:44 PM	Analysis	Details
		2/7/2018 4:18:40 PM	Analysis	Details
		2/7/2018 4:17:41 PM	Analysis	Details
		2/7/2018 4:16:42 PM	Analysis	Details
		2/7/2018 4:15:43 PM	Analysis	Details
		2/7/2018 4:14:44 PM	Analysis	Details

Figure 17 – Measurements

To view the detailed information about the chromatogram, select [Details] on the required entry in the analyses list. The following information will be available for the user in the opened page (Figure 18):

- "Analysis date" measurements date;
- "Analysis type" possible values "Calibration", "Manual", "Analysis";
- "Calibration" reference to the calibration;
- "Atmospheric pressure" atmospheric pressure at the time of analysis beginning;
- "Methane by difference" the flag indicates the method of methane calculation;
- "Combustion temperature" the following values can be set to: 0, 15, 20, and 25 °C;
- "Measurement temperature" the following values can be set to: 0, 15, and 20 °C;
- Analysis physical and chemical parameters and their absolute expanded uncertainty (Figure 19):
 - "Name";
 - "Value";
 - "Absolute expanded uncertainty";
- List of components (Figure 20):

- "Name" component name;
- "Area" peak area;
- "Height" peak height;
- "Content" component content is indicated in molar percentage;
- $\circ\,$ "Absolute expanded uncertainty" measurement result uncertainty of the component molar fraction.

To export the measurement results, click the "Export" button. All analyses for the selected period but not more than 1000 entries will be saved in the exported file.

Details - WebConsole	× \		
$\leftarrow \rightarrow C$ (i) localhost:4	7959/Analyz	es/Details/a95ebffc-a34c-4e37-86bf-79f172576317	☆ :
A Measurements	Archive	Settings Users About	admin Sign out
Analyses	>	Dotails	
Calibrations	>	Details	
Average values	>		
Report	>		
Shewhart chart	>	Name	Value
Trends	>	Analysis date	7/5/2017 9:31:16 AM
		Analysis type	Analysis
		Calibration	Details
		Atmosphere pressure	0
		Physical and chemical properties	
			Absolute expanded

Figure 18 – Measurements. Details

O Details - WebConsole X				1 23
\leftrightarrow \rightarrow C (i) localhost:47959/Analyzes	s/Details/a95ebffc-a34c-4e37-86bf-79f172576317		Ĩ	☆ :
	Physical and chemical properties			•
	Name	Value	Absolute expanded uncertainty	ł
	Wobbe index of real gas, gross (kcal/m3)	11967.17004	20.23727	
	Measurement temperature	20°C		
	NCV, volume (MJ/m3) ideal gas	34.58854	0.05444	
	Density of real gas (kg/m3)	0.70828	0.00099	
	GCV, mass (MJ/kg)	54.24721	0.08364	
	NCV, molar (cal/mol)	198728.40844	312.80521	
	GCV, molar (cal/mol)	220285.31804	339.64940	
	NCV, mass (MJ/kg)	48.93863	0.07703	
	NCV, volume (kcal/m3) ideal gas	8261.33072	13.00361	
	GCV, volume (kcal/m3) real gas	9176.97270	14.11955	
	Wobbe index of ideal gas, net (MJ/m3)	45.14460	0.07782	
	Wobbe index of ideal gas, gross (MJ/m3)	50.04162	0.08480	-

Figure 19 – Measurements. Details (analysis physical and chemical parameters)

O Details - WebConsole X					8.00	1 23
\leftrightarrow \rightarrow C (i) localhost:47959/Analyz	es/Details/49764083-a5b1-4	5b2-9abd-4e3457a172b0)		7	: ۲
	Components					•
	Name	Area	Height	Concentration	Absolute expanded uncertainty	
	Carbon Dioxide	0.08081	0.68237	0.23400	0.01524	
	Ethane	1.05658	7.81842	2.92922	0.11743	
	Helium	0.00000	0.00000	0.01070	0.00088	
	Hydrogen	0.00000	0.00000	0.00185	0.00035	
	Iso-Butane	0.07541	0.80446	0.14207	0.00876	
	Isopentane	0.01460	0.09128	0.02451	0.00171	
	Methane	0.00000	0.00000	94.94264	0.10457	
	N-Butane	0.07342	0.69365	0.13610	0.00841	
	N-Hexane	0.01344	0.15757	0.01134	0.00092	- 1
	N-Pentane	0.01051	0.05818	0.01759	0.00130	
	Neopentane	0.00086	0.00765	0.00205	0.00036	
	Nitrogen	0.36258	3.44782	0.62185	0.02617	-

Figure 20 – Measurements. Details (components list)

The software automatically calculates the expanded uncertainty of the components molar fraction measurement results in accordance with GOST 31371.7-2008 (Figure 20). These values are indicated in the "Absolute expanded uncertainty" column of the component table.

The expanded uncertainty of natural gas FCP calculated in accordance with GOST 31369-2008 are indicated in the "Absolute expanded uncertainty" column of the physical and chemical parameters table (Figure 19).

The software automatically calculates the relative deviation of components molar fraction in the calibration gas from the measured value of components molar fraction in the sampled gas, and compares the obtained value with the maximum permissible value specified in GOST 31371.6-2008. In case of standard value exceedance, the software issues the warning "Calibration and sampled gases differ" (Figure 21).

Calibration and sampled gases differ

Figure 21 – Warning. Calibration and sampled gases differ.

3.8 Calibration gas

To enter and change entries on the calibration gas, select [Settings] \rightarrow [Calibration gas] (Figure 22).

A list of calibration gases will be available for the user. The gas used for automatic chromatograph calibration will be highlighted in green. Here the user can delete, edit the selected gas or create a new one.



Figure 22 – List of calibration gases

Click the [Create] button to add a new gas. Specify a calibration gas name (Figure 23) and click the [Save] button. As a result, the page describing the calibration gas will be available (Figure 24).

- "Name" calibration gas name;
- "Created" entry date;
- "Expiry date" calibration gas expiration date is indicated;
- "Active" the flag indicates whether this gas is used during chromatograph calibration;
- "Components" a list of components and their content in the gas:
 - "Name" component name;
 - "Content" component content (in molar percentage);

To change or edit the calibration gas description, go to the page describing the calibration gas (Figure 24).

•

General	>	Create calibration das	
Console	>	create calibration gas	
Modbus	>	Name	
Calculation	>		
Startup	>	Save	
Calibration gases	>	Cancel	
Operation logs	>		
Scheduler	>		
Reports	>		

Figure 23 – Create calibration gas

Measurements	Archive	Settings Users Ab	out	admin Sign ou
General	>	Colibration	•	
Console	>	Calibration g	35	
Modbus	>	Name	Баллон II 254	
Calculation	>	Hume	Ballion Ji 234	
Startup	>	Created	6/22/2017 1:09:13 PM	
Calibration gases	>	Expiry Date	6/22/2018 1:09:13 PM	
Operation logs	>	Active		
Scheduler	>	Adure		
Reports	>		Save Delete	
		Component		
		Add component		
		Name	Concentration	

Figure 24 – Calibration gas

To add a component to the calibration gas, click the [Add component] button (Figure 24). Select a component name from the drop-down list and specify the component content in molar percentages (Figure 25).

General	>	Add compon	ont		
Console	>	Add compon			
Modbus	>	Nameld	2.2. Directhulbutano		
Calculation	>	Raffeld	2.3-Dimenyibutane		
Startup	>	Concentration	0	*	~
Calibration gases	>		Component concentration indicated in mole percentage		
Operation logs	>		Save		
Scheduler	>	Cancel			
Reports	>	Cancer			
	-				

Figure 25 – Add component

3.9 Calibration log

To view the calibration log, select [Measurements] from the main menu \rightarrow [Calibrations] (Figure 26). The following information will be available for the user:

- "Creation date" the date of calibration factors calculation;
- "Success" operation status flag.

Calibrations – WebConso	×			
\rightarrow C (i) localhost:4	7959/Analy	zes/Calibration		ጵ
Measurements	Archive	Settings Users About		admin Sign out
Analyses	>	Calibrations		
Calibrations	>	Calibrations		
Average values	>	Creation date	Success	
Report	>		Success	
Shewhart chart	>	7/5/2017 7:48:32 AM		Details
Trends	>	7/4/2017 4:48:30 PM	A.	Details
		7/4/2017 7:48:30 AM	4	Details
		7/3/2017 12:49:24 PM	I.	Details
		7/3/2017 12:40:16 PM		Details
		7/3/2017 10:46:36 AM	A	Details
		7/3/2017 10:37:28 AM		Details
		6/28/2017 8:46:36 AM		Details

Figure 26 – Calibrations

3.10 Chromatograph calibration

The dataflow chromatograph is automatically calibrated according to the scheduler settings (item 4.5). Calibration factors can be only set by the software based on the calibration chromatograms.

Switching from the operating flow to the calibration one takes place in the automatic mode, and calibration chromatograms are registered, then the software calculates the calibration factors. Upon completion of calibration, the flow is changed to operating one.

The "CHROMOS PGC-1000" software calculates calibration factors for all components at each injection of the calibration gas and upon completion of calibration it calculates the final calibration factors as an average of the three values obtained during the calibration process.

In case of non-compliance with calibration acceptability criteria by any of the components, the software generates a warning (Figure 27). The final calibration report contains an error and to proceed calculating, the software takes the calibration factors obtained at the last calibration that meets the acceptability requirements.

\rightarrow C 🛈 localhost:4	7959/Analy	zes/CalibrationDetails/88b46a6a-457b-4	3c3-963f-473e70cc320a	☆
Measurements	Archive	Settings Users About	admin Sigr	ו out
Analyses	>	Colibration		
Calibrations	>	Calibration		
Average values	>			
Report	>			
Shewhart chart	>	Name	Value	
Trends	>	Creation date	11/5/2015 3:09:46 PM	
		Calibration gas	ИПГ №1387 Details	
		Atmosphere pressure	0	
		Success		
		Factors		
		Name K1	Average K2 K3 factor Delta Standard Success	

Figure 27 – Calibrations. Details (Failed)

To view the detailed information on the selected calibration, select [Details] in the calibration log (Figure 27). The following information will be available for the user (Figure 28):

- "Creation date" the date of calibration factors calculation;
- •
- "Graduation gas" calibration cylinder name;
- "Atmospheric pressure" atmospheric pressure at the time of calibration beginning;
- "Success" operation status flag;

- "Factors" calibration factors list:
 - "Name" component name;
 - "K1" calibration factor obtained from chromatogram 1;
 - \circ "K2" calibration factor obtained from chromatogram 2;
 - "K3" calibration factor obtained from chromatogram 3;
 - $\circ~$ "K" an arithmetical average of the calibration factors obtained from three calibration chromatograms;
 - "Delta" a deviation;
 - "Standard" permissible deviation;
 - "Success" operation status flag.
- "Chromatogram" calibration chromatograms on which the calibration factors were calculated (Figure 29).

Calibration - WebConsole	×\							8.00	
\rightarrow C (i) localhost:4	7959/Analy	zes/CalibrationDetails/c5cb)6a2-329e-409	d-b5cd-4993	3dfaafd8b			\$	•]
A Measurements	Archive	Settings Users	About				admi	n Sign out	
Analyses	>	Colibration							
Calibrations	>	Calibration							
Average values	>								
Report	>								
Shewhart chart	>	Name			Value				
Trends	>	Creation date			11/6/2015 4:41:22 PN	1			
		Calibration gas			ИПГ №1387 Detai	Is			
		Atmosphere pressure	5		0				
		Success							
		Factors							
					Average				
		Name	K1	K2	K3 factor	Delta	Standard	Success	

Figure 28 – Calibrations. Details

Calibration - WebConsole ×			
$\epsilon \rightarrow \mathbf{C}$ (i) localhost:47959/Analy	zes/CalibrationDetails/c5cb96a2-329e-409d-b	5cd-4993dfaafd8b	☆ :
	Chromatogram 1 [Components]		
	Name	Area	Height
	Carbon Dioxide	0.07052	0.57386
	Ethane	1.25175	8.93527
	Iso-Butane	0.10320	1.09680
	Isopentane	0.02560	0.16452
	N-Butane	0.10440	0.99101
	N-Hexane	0.02920	0.32022
	N-Pentane	0.01875	0.10838
	Neopentane	0.00136	0.01241
	Nitrogen	0.45287	4.61290
	Oxygen	0.00478	0.04915
	Propane	0.53127	6.76821
	0.0000000000000000000000000000000000000		

Figure 29 – Calibrations. Details (Calibration chromatograms)

3.11 Average values

To view an arithmetic average of the FCP determination result, select [Measurements] \rightarrow [Average values] from the main menu and specify the measurement period (Figure 30). The following information will be available for the user:

- "Last hour" one hour before the current time;
- "Today" from the day beginning to the current time;
- "Last 7 days" from the current moment for the last 7 days;
- "Last 30 days" from the current moment for the last 30 days;
- "Last year" all the measurements made this year;
- "Date range" to specify an arbitrary time interval.

Average values – WebCo	×\							800
\rightarrow C i localhost:4	7959/Analyz	es/Middle?range=last_yea	r					☆
Measurements	Archive	Settings Users	About				admin	Sign out
Analyses	>		luos					
Calibrations	>	Average va	lues					
Average values	>							
Report	>	Last Hou	r Today	Last 7 days	Last 30 days	Last year	Date Range	
Shewhart chart	>							
Trends	>	Report						
		Number of chromate	grams in the	report: 976				
		Physical and chemica	l properties					
		Name				V	e alue un	Absolute xpanded certainty
		Wobbe index of real	gas, gross (ko	cal/m3)		11965.56	6178	0.00000

Figure 30 – Average values. Filter

3.12 Report

To view the report, select [Measurements] \rightarrow [Report] from the program main menu and specify the measurement period and the period on which the analysis results are grouped (Figure 31):

Analyses	>	Report		
Calibrations	>			
Average values	>	Date from	5/7/2018	
Report	>	D -4-4-		
Shewhart chart	>	Date to	6/7/2018	
Trends	>	Group By	Hour	
			Apply	

Figure 31 – Report

3.13 Shewhart chart

To view the Shewhart chart, select [Measurements] \rightarrow [Shewhart chart] from the main menu and specify the measurement period and the component to be analyzed (Figure 32):

Shewhart chart - WebCor	×			
\leftrightarrow \rightarrow C i localhost:4	17959/Analy	zes/Shewhart		☆
A Measurements	Archive	Settings Users Abo	but admir	n Sign out
Analyses	>	Showbart ch	art	
Calibrations	>	Onewhart cha		
Average values	>	from	5/7/2018	
Report	>			
Shewhart chart	>	to	6/7/2018	
Trends	>	Name	1.2-Butadiene	-
			Apply	

Figure 32 – Shewhart chart

3.14 Trends

To view the trend, select [Measurements] \rightarrow [Trends] from the program main menu, and specify the measurement period on which the analysis results are grouped (Figure 33):

O O localhost:4	7959/Analy:	zes/Trends			\$
Measurements	Archive	Settings Users Abo	put	admin	Sign out
Analyses	>	Tranda			
Calibrations	>	Trends			
Average values	>	from	5/7/0040		
Report	>	nom	5///2018		
Shewhart chart	>	to	6/7/2018		
Trends	>	Group By	Hour		-
		Name	1.2-Butadiene		•
			Apply		

Figure 33 – Trends

4 Setting

To change the settings of the main program modules, select [Settings] from the main menu (Figure 34).



Figure 34 – Settings

Control:

- "Shut down and then restart the chromatograph" when this action is selected, the entire software restarts without waiting for tasks completion;
- "Chromatograph power off" when this action is selected, the automation system waits for completion of the current operation, changes over to the cooling mode, and turns off the system.

4.1 Console

To change a program interface language, select [Settings] \rightarrow [Console] and specify one of the supported languages in the drop-down list, then click Save (Figure 35).

Console – WebConsole	×			
\rightarrow C (i) localhost:4	17959/Settin	gs/Console		\$
Measurements	Archive	Settings Users About		admin Sign out
General	>	Cancala		
Console	>	Console		
Modbus	>			_
Calculation	>	Language		•
Startup	>	Number of digits 5		* *
Calibration gases	>	Rounding as per		
Operation logs	>	GOST 31371.7-2008		
Scheduler	>	Physical and chemical properties	3	60
Reports	>	Display Name		
		Wobbe index o	f real gas, gross (kcal/m3)	~ ~
		Measurement t	emperature	~ ~
		NCV, volume (I	MJ/m3) ideal gas	× ×
		Density of real	aas (ka/m3)	

Figure 35 – Console

Change data display in the application by the options:

- "Number of digits" setting a number of decimal places;
- "Rounding as per GOST 31371.7-2008" rounding in accordance with GOST 31371.7-2008;
- Analysis physical and chemical parameters to hide/display a parameter, check/uncheck a mark against the property;
- To change the order of displaying properties, click the up or down arrow against the property.

4.2 Modbus

The Modbus module can be used to transmit data via serial communication lines RS-485, and TCP/IP networks (Modbus TCP).

O Modbus - WebConsole	×		
\leftrightarrow \rightarrow C (i) localhos	st:47959/Settin	gs/Modbus	\$
	s Archive	Settings Users Ab	xbout admin Sign out
General	>	Modbus	
Console	>	Modbus	
Modbus	>	Modbus TCP	
Calculation	>	Modbus Tor	
Startup	>	Tcp Id	1
Calibration gases	>	TCP Port	502 🔹 🗸
Operation logs	>	Modbus RTU	
Scheduler	>	Rtu Id	
Reports	>		
		COM Port	COM1 •
		Baud Rate	9600 🔹
		Data Bits	8
		Parity	None

Figure 36 – Modbus

To change the parameters for starting up Modbus, select [Settings] \rightarrow [Modbus]. The following information will be available for the user (Figure 36):

- "Modbus TCP" start Modbus Slave TCP;
- "Modbus RTU" start Modbus Slave RTU;
- "TCP Port" port TCP number on which Modbus Slave TCP is started;
- "Com Port" port COM number on which Modbus Slave RTU is started;
- "Baud Rate" data transmission rate. The following transmission rate values may be indicated: 1200, 2400, 4800, 9600, 192000, 38400, 57600, 115200;
- "Data Bits" defining a number of data bits in the transmitted and received bytes. A number of data bits may be within the range of 4 to 8;
- "Parity" determines the choice of the even parity control diagram. This field shall contain one of the following values:
 - "None" no parity bit;
 - "Odd" addition to odd parity;
 - "Even" addition to even parity;
 - "Mark" parity bit, always 1;
 - "Space" parity bit, always 0;
- "Stop bits" setting a number of stop bits.

4.3 Automation setting

To change the automation system settings, select [Settings] \rightarrow [Start] (Figure 37). The following information will be available for the user:

- "Started channels" a number of measurement channels; •
- "Automation" indication to enable the automation system or not; •
- "Sampled flow" – default sampled flow number;
- "Calibration flow" default calibration flow number; ٠
- "Purge time" holding time after flow change. •
- "Conditioning time" column conditioning time. •

Measurements	Archive	Settings Users At	pout	admin	Sign out
General	>	Startup			
Console	>	Startup			
Modbus	>	Started channels			
Calculation	>	Started channels	2		`
Startup	>	Automation			
Calibration gases	>		start of automatic measurements collection		
Operation logs	>	Sampled flow	1		•
Scheduler	>	Calibration flow	2		•
Reports	>				
		Purge time	00:20:00		C
			hold time after flow change		
		Conditioning time	00:00:00		G
			column conditioning time		

Figure 37 – Automation setting

4.4 Operation logs

Selection of [Settings] \rightarrow [Operation logs] provides specifying the directories where the program operation logs are located (Figure 38).

Measurements	Archive	Settings Users Abo	put	admin Sign ou
General	>	l en files		
Console	>	Log mes		
Modbus	>	Operation log (Web)	C:\inetnuh\www.con\\ogs	
Calculation	>	operation log (res)	C. unetpublik www.ootilogs	
Startup	>	Default Web file name	current.log	
Calibration gases	>	Operation log (Bot)	C:\ChromosFlow\logs	
Operation logs	>	Default Bot file name	current log	
Scheduler	>		currenting	
Reports	>	Operation log (Chromos)	C:\Users\Public\Documents\Chromos	
		Default Chromos file name	Chromos.log	
			Save	

Figure 38 – Log files

4.5 Scheduler

Selection of [Settings] \rightarrow [Scheduler] provides adding or deleting a task to/from the scheduler (Figure 39).

Measurements	Archive	Settings Users	About	admin Sign o
General	>			
Console	>	Scheduler		
Modbus	>			
Calculation	>	Add a new task	Action	
Startup	>	****	Applysis	
Calibration gases	>		Analysis	Change Delete
Operation logs	>			
Scheduler	>			
Reports	>			

Figure 39 – Scheduler

Click the [Add a New Task] button to create a new task (Figure 40). The tasks edition form contains the following fields:

- "Minute";
- "Hour";
- "Day";
- "Month";
- "Day of week";
- "Action" the action of which shall be done upon event occurrence:
 - "Analyze";
 - "Calibrate".

Input is done either through pop-up dialogs or manually. The record format states that all values are entered with separation by a comma, and the symbol '*' means any value.

All conditions (start-up time) are checked by the "logical AND".

Add a new task – WebCo	×		
→ C ③ localhost:	47959/Settir	ngs/SchedulerCreate	☆
A Measurements	Archive	Settings Users Ab	out admin Sign out
General	>	Add a powrta	nek.
Console	>	Auu a new la	
Modbus	>	Minuto	•
Calculation	>	Winute	
Startup	>	Hour	*
Calibration gases	>		
Operation logs	>	Day of month	*
Scheduler	>	Month	*
Reports	>		
		Day of week	*
		A c41	
		Action	Analysis
			Save
		Dock to List	

Figure 40 – Add a New Task

4.6 Reports

Selection of [Settings] \rightarrow [Reports] provides specifying values for additional fields in the reports (Figure 41).

- "Header" the line displayed at the beginning of the report;
- "Footer" the line displayed at the end of the report.

General	>	Departo				
Console	>	Reports				
Modbus	>	Hondor				
Calculation	>	Header				
Startup	>	Footer				
Calibration gases	>					
Operation logs	>		Save			
Scheduler	>					
Reports	>					

Figure 41 – Reports

When entering, substitutions may be used:

- #d0# current time;
- #d1# time of period start for which the counting is formed;
- #d2# time of period end for which the counting is formed;

5 Program identification

To view the identification data of the "CHROMOS PGC-1000" software (version number and hash sum), select [About] from the main menu (Figure 42).

🕽 About – WebConsole 🛛 🗙 🚺				23
→ C 🛈 localhost:47959/Ho	me/About		\$] :
A Measurements Archiv	e Settings	Users About	admin Sign out	
About				
	V			
	XI		IVIUL	
CHROMOS PGC-1000				
ATTENTION! This software produ or any of the parts entails civil and	ict is protected by discriminal liability.	the copyright laws	and international agreements. Illegal reproduction or distribution of the program	
Carry components				
File name	Version	Algorithm	Hash sum	
Chromos.Calc.dll	1.2.0.0	SHA1	7f217998-e840a84d-fa78bd3b-d9d97592-90db3c08	
Chromos.ModBus.dll	1.2.1.0	SHA1	0e9aa75e-b5e04aa7-c9736645-827aab02-f06ffd67	
Chromos.Flow.exe	1.3.8.0	SHA1	a91b7402-e7d4d11d-d82abcba-2be62600-81559512	

Figure 42 – About the program

The components list contains the following:

- "File name";
- "Version" file version;
- "Algorithm" the algorithm on which the hash sum was calculated;
- "Hash sum".

6 Data exchange

The main communication port for data exchange is the TCP/IP port. The Modbus RTU port is also available. The TCP/IP port (Gigabit Ethernet) is required to connect to the chromatograph control console via HTTP protocol (for configuration, diagnostics and reporting), but it can be used in combination with Modbus TCP/IP.

6.1 Modbus protocol

The Modbus map is adjustable in the "CHROMOS PGC-1000" software, it is possible to change the register addresses and the encoding method.

6.2 Modbus protocol. By default

In the MODBUS protocol, the FLOAT number is represented as two registers:

Register with address XXXX F			Re	legister with address XXXX+1			
	Byte 3	Byte 4	В	Byte 1 Byte 2		Byte 2	
	-					-	
	Function code:			4 READ IR			
Address	Name			Component		Data type	
0	Reserved					UINT (16-bit)	
	Values:						
	Current protoco	ol version 1					
1	1 Error Code #1					UINT (16-bit)	
2	2 Error Code #2					UINT (16-bit)	
3	Reserved					UINT (16-bit)	
4	Reserved					UINT (16-bit)	
5	Reserved					UINT (16-bit)	
6	Reserved					UINT (16-bit)	
7	Reserved					UINT (16-bit)	
8	Reserved					UINT (16-bit)	
9	Reserved					UINT (16-bit)	
		Final a	nalysis				
		Analys	is date				
10	Year (Analysis	date)				UINT (16-bit)	
11	Month					UINT (16-bit)	
12	Day					UINT (16-bit)	
13	Hour					UINT (16-bit)	
14	Minute					UINT (16-bit)	

15	Second	UINT (16-bit)
16	Type (Analysis status)	UINT (16-bit)
	Values:		
	0 — Success		
	1 — Calibration		
	2 — Manual mode		
	3 — Calibration and sampled gases differ		
	Physical and chemical para	ameters	
17	Zmix (Compressibility factor)	FLOAT	
19	M (Molar mass)	FLOAT	
21	HmolV (GCV, molar (real and ideal gas))	FLOAT	
23	HmolV (NCV, molar (real and ideal gas))	FLOAT	
25	HmassV (GCV, mass (real and ideal gas))	FLOAT	
27	HmassV (NCV, mass (real and ideal gas))	FLOAT	
29	HvolV0 (GCV, volume (ideal gas))	FLOAT	
31	HvolN0 (NCV, volume (ideal gas))	FLOAT	
33	HvolV (GCV, volume (real gas))	FLOAT	
35	HvolN (NCV, volume (real gas))	FLOAT	
37	Ro0 (density of ideal gas)	FLOAT	
39	Ro (density of real gas)	FLOAT	
41	D0 (relative density of ideal gas)	FLOAT	
43	D0 (relative density of real gas)	FLOAT	
45	WobbeV0 (Wobbe index of ideal gas, gross)	FLOAT	
47	WobbeN0 (Wobbe index of ideal gas, net)	FLOAT	
49	WobbeV (Wobbe index of real gas, gross)	FLOAT	
51	WobbeN (Wobbe index of real gas, net)	FLOAT	
53	IsMethaneByDifference (Methane by Difference)	UINT (16-bit)
54	BurnoutTemperature (Combustion temperature)	UINT (16-bit)
	Values:		
	0 — 0 deg. C		
	1 — 15 deg. C		
	2 — 20 deg. C		
	3 — 25 deg. C		
	-		
55	MeasureTemperature (Температура измерения)	UINT (16-bit)
	/		
	Values:		
	0 — 0 deg. C		
	1 — 15 deg. C		

2 — 20 deg. C		
56 Reserved		UINT (16-bit)
57 Reserved		UINT (16-bit)
58 Reserved		UINT (16-bit)
59 Reserved		UINT (16-bit)
60 Reserved		UINT (16-bit)
61 Reserved		UINT (16-bit)
62 Reserved		UINT (16-bit)
63 Reserved		UINT (16-bit)
64 Reserved		UINT (16-bit)
65 Reserved		UINT (16-bit)
66 Reserved		UINT (16-bit)
67 Reserved		UINT (16-bit)
68 Reserved		UINT (16-bit)
69 Reserved		UINT (16-bit)
Components		<u> </u>
70 1 Molar fraction, %	Methane	FLOAT
72 2 Molar fraction, %	Ethane	FLOAT
74 3 Molar fraction, %	Propane	FLOAT
76 4 Molar fraction, %	n-Butane	FLOAT
78 5 Molar fraction, %	i-Butane	FLOAT
80 6 Molar fraction, %	n-Pentane	FLOAT
82 7 Molar fraction, %	i-Pentane	FLOAT
84 8 Molar fraction, %	neo-Pentane	FLOAT
86 9 Molar fraction, %	n-Hexane	FLOAT
88 10 Molar fraction, %	2-Methylpentane	FLOAT
90 11 Molar fraction, %	3-Methylpentane	FLOAT
92 12 Molar fraction, %	2·2-Dimethylbutane	FLOAT
94 13 Molar fraction, %	2·3-Dimethylbutane	FLOAT
96 14 Molar fraction, %	n-Heptane	FLOAT
98 15 Molar fraction, %	n-Octane	FLOAT
100 16 Molar fraction, %	n-Nonane	FLOAT
102 17 Molar fraction, %	n-Decane	FLOAT
104 18 Molar fraction, %	Ethylene	FLOAT
106 19 Molar fraction, %	Propylene	FLOAT
108 20 Molar fraction, %	1-Butene	FLOAT
110 21 Molar fraction, %	cis-2-Butene	FLOAT
112 22 Molar fraction, %	trans-2-Butene	FLOAT
114 23 Molar fraction, %	2-Methylpropene	FLOAT
116 24 Molar fraction, %	1-Pentane	FLOAT
118 25 Molar fraction, %	Propadiene	FLOAT
120 26 Molar fraction, %	1.2-Butadiene	FLOAT

122 27 Molar fraction, %	1.3-Butadiene	FLOAT
124 28 Molar fraction, %	Ethyne	FLOAT
126 29 Molar fraction, %	Cyclopentane	FLOAT
128 30 Molar fraction, %	Methyl cyclopentane	FLOAT
130 31 Molar fraction, %	Ethyl cyclopentane	FLOAT
132 32 Molar fraction, %	Cyclohexane	FLOAT
134 33 Molar fraction, %	Methylcyclohexane	FLOAT
136 34 Molar fraction, %	Ethyl cyclohexane	FLOAT
138 35 Molar fraction, %	Benzol	FLOAT
140 36 Molar fraction, %	Toluene	FLOAT
142 37 Molar fraction, %	Ethyl benzene	FLOAT
144 38 Molar fraction, %	o-Xylene	FLOAT
146 39 Molar fraction, %	Methanol	FLOAT
148 40 Molar fraction, %	Methanethiol	FLOAT
150 41 Molar fraction, %	Hydrogen	FLOAT
152 42 Molar fraction, %	Water	FLOAT
154 43 Molar fraction, %	Hydrogen sulphide	FLOAT
156 44 Molar fraction, %	Ammonia	FLOAT
158 45 Molar fraction, %	Hydrogen cyanide	FLOAT
160 46 Molar fraction, %	Carbon monoxide	FLOAT
162 47 Molar fraction, %	Carbonyl sulfide	FLOAT
164 48 Molar fraction, %	Carbon disulfide	FLOAT
166 49 Molar fraction, %	Helium	FLOAT
168 50 Molar fraction, %	Neon	FLOAT
170 51 Molar fraction, %	Argon	FLOAT
172 52 Molar fraction, %	Nitrogen	FLOAT
174 53 Molar fraction, %	Oxygen	FLOAT
176 54 Molar fraction, %	Carbon dioxide	FLOAT
178 55 Molar fraction, %	Sulfur dioxide	FLOAT
180 56 Molar fraction, %	Air	FLOAT

6.3 Modbus map setting

The Modbus map is set by editing the file: "C:\ChromosFlow\modbus.xml". The file can be edited manually by changing the XML-code using any text editor.

The root element "modbus.xml" is <modbus>. In addition to this element, the mandatory element is the <param> tag. Arrangement of elements of the same level is arbitrary. All values are set by means of the elements attributes.

<modbus> – the element is the root one. By default, the element contains two attributes:

<modbus xsi:noNamespaceSchemaLocation="http://office.has.ru/files/modbus.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

- xmlns:xsi name space determination. It is always the same;
- xsi:noNamespaceSchemaLocation reference to XSD schema in the document. It is alway the same.

param> – the element determines an element type and location in the Modbus card.

<param addr="19" modbus_function="4" reverse_bytes="false" reverse_words="true"
type="float" name="Property.Gost313692008M" />

Attributes:

- addr address of the first parameter register in decimal form;
- modbus_function read function (3-4);
- reverse_bytes if "true", it changes byte order in each register to "high byte first";
- reverse_words if "true", it changes register order to "high register first";
- type what value type is to be written to the data block:
 - i16 signed integer 16 bits;
 - ui16 unsigned integer 16 bits;
 - i32 signed integer 32 bits;
 - ui32 unsigned integer 32 bits;
 - float 32-bit floating-point number;
 - double 64 bits floating-point number;
- name parameter name:
 - Error.Chromos instrument error code;
 - Error.Bot automation error code;
 - AssayDate.Year measurement time, year;
 - AssayDate.Month measurement time, month;
 - AssayDate.Day measurement time, day;
 - AssayDate.Hour measurement time, hour;
 - AssayDate.Minute measurement time, minute;
 - AssayDate.Second measurement time, second;
 - AssayDate.UnixTime measurement time, unix time format, 32 bits;
 - AssayType measurement type:
 - 0 normal measurement;
 - 1 calibration;
 - 2 manual start;

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- 3 rejected measurement;
- Property.Gost313692008BurnoutTemperature combustion temperature;
- Property.Gost313692008D relative density of real gas (kg/m3);
- Property.Gost313692008D0 relative density of ideal gas (kg/m3);
- Property.Gost313692008HmassN NCV, mass (mJ/kg);
- Property.Gost313692008HmassNKcal NCV, mass (kcal/kg);
- Property.Gost313692008HmassV GCV, mass (mJ/kg);
- Property.Gost313692008HmassVKcal GCV, mass (kcal/kg);
- Property.Gost313692008HmolN NCV, molar (kJ/mol);
- Property.Gost313692008HmolNCal NCV, molar (kJ/mol);
- Property.Gost313692008HmolV GCV, molar (kJ/mol);
- Property.Gost313692008HmolVCal GCV, molar (kJ/mol);
- Property.Gost313692008HvolN NCV, volume (mJ/m3) real gas;
- Property.Gost313692008HvolN0 NCV, volume (mJ/m3) ideal gas;
- Property.Gost313692008HvolN0Kcal NCV, volume (kcal/m3) ideal gas;
- Property.Gost313692008HvolNKcal NCV, volume (kcal/m3) real gas;
- Property.Gost313692008HvolV GCV, volume (mJ/m3) real gas;
- Property.Gost313692008HvolV0 GCV, volume (mJ/m3) ideal gas;
- Property.Gost313692008HvolV0Kcal GCV, volume (kcal/m3) ideal gas;
- Property.Gost313692008HvolVKcal GCV, volume (kcal/m3) real gas;
- Property.Gost313692008IsMethaneByDifference methane by difference;
- Property.Gost313692008M Molar mass (kg/mol);
- Property.Gost313692008MeasureTemperature measurement temperature;
- Property.Gost313692008Ro density of real gas (kg/m3);
- Property.Gost313692008Ro0 density of ideal gas (kg/m3);
- Property.Gost313692008WobbeN Wobbe index of real gas, net (mJ/m3);
- Property.Gost313692008WobbeN0 Wobbe index of ideal gas, net (mJ/m3);
- Property.Gost313692008WobbeN0Kcal Wobbe index of ideal gas, net (kcal/m3);
- Property.Gost313692008WobbeNKcal Wobbe index of real gas, net (kcal/m3);
- Property.Gost313692008WobbeV Wobbe index of real gas, gross (mJ/m3);
 Property.Gost313692008WobbeV0 Wobbe index of ideal gas, gross (mJ/m3);
- Property.Gost313692008WobbeV0Kcal Wobbe index of ideal gas, gross (kcal/m3);
- Property.Gost313692008WobbeVKcal Wobbe index of real gas, gross (kcal/m3);
- $\circ \quad Property. Gost 313692008 Zmix-compressibility\ factor;$
- Component.1_2_butadiene 1.2-Butadiene;
- Component.1_3_butadiene 1.3-Butadiene;
- Component.1_butene 1-Buten;
- Component.1_pentene 1-Pentan;
- Component.2_2_dimethylbutane 2.2-dimethylbutane;
- Component.2_3_dimethylbutane 2.3-dimethylbutane;
- Component.2_methylpentane 2-methylpentane;
- Component.3_methylpentane 3-methylpentane;
- Component.acetylene acetylene;
- Component.air air;
- Component.ammonia ammonia;
- Component.argon argon;

- Component.benzene benzene;
- Component.carbon_dioxide carbon dioxide;
- Component.carbon_disulfide Carbon disulfide;
- Component.carbon_monoxide carbon monoxide;
- Component.carbonyl_sulfide carbonyl sulfide;
- Component.cis_2_butene cis-2-butene;
- Component.cyclohexane cyclohexane;
- Component.cyclopentane cyclopentane;
- Component.ethane ethane;
- Component.ethylbenzene ethylbenzene;
- Component.ethylcyclohexane ethylcyclohexane;
- Component.ethylcyclopentane ethylcyclopentane;
- Component.ethylene ethylene;
- Component.helium helium;
- Component.hydrocyanic_acid hydrogen cyanide;
- Component.hydrogen hydrogen;
- Component.hydrogen_sulphide hydrogen sulfide;
- Component.iso_butane i-butane;
- Component.2_methylpropene 2-methylpropene;
- Component.isopentane i-pentane;
- Component.methane methane;
- Component.methanethiol methanethiol;
- Component.methanol methanol;
- Component.methylcyclopentane methylcyclopentane;
- Component.methylcyclopentane methylcyclopentane;
- Component.n_butane n-butane;
- Component.n_decane n-decane;
- Component.n_heptane n-heptane;
- Component.n_hexane C6+;
- Component.n_octane n-octane;
- Component.n_pentane n-pentane;
- Component.neon neon;
- Component.neopentane neopentane;
- Component.nitrogen nitrogen;
- Component.nonane n-nonane;
- Component.o_xylene o-xylene;
- Component.oxygen oxygen;
- Component.propadiene propadiene;
- Component.propane propane;
- Component.propylene propylene;
- Component.sulphur_dioxide sulfur dioxide;
- Component.toluene toluene;
- Component.trans_2_butene trans-2-butene;
- Component.water water;