User Manual

CODAC Core System 5.2 CS-Studio Release Notes

This release supports the integration of CS-Studio 4.3 into CODAC Core System 5.2 with some ITER specific features such as the integration of BEAST alarm information in the operator interface BOY, a new layout for the alarm table with the background of the alarm message reflecting the severity and the new fluid symbols with transient states (opening, closing, running...).
<table>
<thead>
<tr>
<th>Version</th>
<th>Latest Status</th>
<th>Issue Date</th>
<th>Description of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>v0.0</td>
<td>In Work</td>
<td>26 Jan 2016</td>
<td></td>
</tr>
<tr>
<td>v1.0</td>
<td>Signed</td>
<td>29 Jan 2016</td>
<td>The purpose of the Release Notes document is to communicate major new features and changes in this release of the CS-Studio as integrated in CODAC Core System 5.2. It also documents known problems and workarounds.</td>
</tr>
<tr>
<td>v1.1</td>
<td>Approved</td>
<td>10 Feb 2016</td>
<td>Appendix section for the symbol library change log. Attached document for the HTML format (same content but non-cropped image files and screenshots).</td>
</tr>
</tbody>
</table>
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1 Introduction

1.1 CODAC Core System Context

In CODAC Core System 5.2, CS-Studio 4.3 with some ITER specific add-ons has been released based on the new Java Data Integration In Real-Time framework - DIIRT 3.

![CS-Studio 4.3](image)

Figure 1-1 CS-Studio 4.3

1.2 Purpose

The purpose of the Release Notes document is to communicate major new features and changes in this release of the CS-Studio as integrated in CODAC Core System 5.2. It also documents known problems and workarounds.

1.3 Scope

This document describes CS-Studio 4.3 for ITER which includes:

- Operator Interface (OPI) – BOY - that connects to the control system, animates graphical widgets according to EPICS process Variable (PV) value, alarm status/severity and connection/RW status, shows PV’s range and alarm limits definition and allows the operator to interact with the process by providing input data and sending commands,
- Alarm System – BEAST - that monitors alarm triggers in the control system and provides essential support to the operator by warning him of situations that need his attention, showing guidance, allowing him to open dedicated displays, execute commands and acknowledge raised alarms,
- PON Archive System – BEAUTY - that monitors archived EPICS PVs in the control system and provides a graphical user interface for displaying live and historic data in a plot, making some computation, adding annotations and exporting samples into different file formats such as Excel spread sheet or Matlab,
- Electronic Logbook – OLOG - that registers events entered manually or generated automatically during operation to keep track of problems, human decisions or actions which were taken during the course of the activity and which may have had an impact on the outcome of the activity.
- Sequence of EPICS commands automation – SCAN.

1.4 Related documents

[RD1] CODAC Core System CS-Studio User Guide (QVBYD8 v1.0)
[RD2] CSS all in one (BFGP5Q v1.8)
2 New Features

2.1 Alarm Pane

An alarm pane has been developed to list active alarms related to the displayed mimic.

Figure 2-1, shows the integration of the alarm pane in ITER standard canvas layout.

![Figure 2-1 Integration of the alarm pane in the canvas layout](image)

The alarm pane offers the same functionalities as the alarm table view – i.e. tick box to acknowledge directly an alarm, severity icon, context menu to access detailed information of the alarm.

2.2 Alarm Coding

The background of the alarm message reflects the severity of the alarm according to the convention illustrated on Figure 2-2 Alarm Coding.

<table>
<thead>
<tr>
<th></th>
<th>Icons</th>
<th>Shelved alarms*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Invalid/Unknown alarm</td>
<td></td>
<td></td>
<td>(255,0,255)</td>
</tr>
<tr>
<td>&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>recovered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acknowledged</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major alarm</td>
<td></td>
<td></td>
<td>(250,15,14)</td>
</tr>
<tr>
<td>&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>recovered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acknowledged</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor alarm</td>
<td></td>
<td></td>
<td>(255,255,0)</td>
</tr>
<tr>
<td>&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>recovered</td>
<td></td>
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</tr>
<tr>
<td>&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>acknowledged</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Shelved – the operator has prevented a nuisance alarm from being displayed for a limited time
2.3 Acknowledge Information and Action in Mimics

BEAST alarm information has been integrated in BOY to allow alarm indications to be shown on mimics to indicate the component that is in an alarm state:

- The symbol background reflects the priority of the alarm
- The component’s symbol flashes at 2Hz until acknowledged by the operator.

Functionality to acknowledge alarms from the mimic has also be provided via a context menu.

2.4 Updated Fluid Symbols

Based on operation requirements, fluid symbols have been redesigned – mainly valve and pump symbols. Figure 2-4 VC – On-Off 2-way Pneumatic Valve provides an example of a multistate valve.

<table>
<thead>
<tr>
<th>0 - CLOSED</th>
<th>1 - OPEN</th>
<th>2 – OPENING (flash)</th>
<th>3 – CLOSING (flash)</th>
<th>4 – HALF-OPEN</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="0-Closed" /></td>
<td><img src="image2" alt="1-Open" /></td>
<td><img src="image3" alt="2-Opening" /></td>
<td><img src="image4" alt="3-Closing" /></td>
<td><img src="image5" alt="4-Half-Open" /></td>
</tr>
</tbody>
</table>

Some symbols have been replaced to reduce the number of symbols supported and new ones have been introduced such as the "VR – Safety Valve".

A migration script `css-opi-updater` has been provided to adapt automatically existing OPI to the new symbols – please refer to the migration manual.

There is also the support of the deprecated symbol library with the command `boy-switch-symbol-version` which allows to change from one library to the other.
2.5 **Extension of XY Graph widget to historic data**

By default, the updated XY Graph widget will try to retrieve -1 hour of archived data (if any).

2.6 **Updated Read-Only Field**

A border has been added to the read-only Text widget in BOY as illustrated in Figure 2-5 Entry and Read-only fields.

![Entry field and Read-only field](image)

Figure 2-5 Entry and Read-only fields

2.7 **Updated Confirm Dialog**

The confirm dialog proposes only **Yes** and **No** options – and no more the **Cancel** option, as illustrated on Figure 2-6 Confirm Dialog Options.

![Confirm Dialog Options](image)

Figure 2-6 Confirm Dialog Options

2.8 **New Pre-Defined Colours**

IO Colour Schema has been extended to entry fields as follow:

```plaintext
# Input Fields
# Focus on Entry
IO Focus Entry = 198, 217, 241

# Valid Entry
IO Valid Entry = 0, 0, 255

# Invalid Entry
```

2.9 **Validation of Entry Field**

It is no more needed to press the **Enter** key in an entry field to validate the value, just losing the focus is enough.

Additional scripts examples have been provided to help the development of faceplate to control components. As illustrated in Figure 2-7 Faceplate Scripts Examples, they include script to initialise local variables, validate input, and submit entered value to the control process.

The faceplate can also provide a **cancel** or undo command for action taking a long time.
2.10 **Image Transparent Property**

A new property has been added to all image widgets, including the symbol widgets. By default, only the background of image widget is transparent. Symbol widgets do not have a background transparent by default as the background shall reflect the severity of the alarm.

2.11 **OPI Rules Validation Update**

OPI validation produces statistics about the number of rules that change dynamically the widget property and the number of scripts developed for an OPI.
3 Integration with SDD

3.1 Canvas and Empty Mimics Generation

From an I&C project, SDD is generating {CBSn}.opi for the ITER standard canvas and prepares an empty mimic {CBSn}_Mimic.opi.

3.2 CBS Navigation Customisation

The generated navigation allows the user to customise the tree from CBS1 by editing directly navigation/Navigation_{CBS1}.xml.

3.3 Templates and HMI Objects/Faceplates

Finally SDD supports templates for HMI object and faceplate such as the one provided in resources and illustrated on Figure 3-1 HMI Object Control Valve and its Faceplate. Please refer to SDD user manual.

Figure 3-1 HMI Object Control Valve and its Faceplate
4 Known Bugs and Limitations

4.1 Icons too small on 4K screen

This a known issue of Eclipse and shall be resolved in the next major release.

4.2 The flash timing of symbols is not synchronised for all flashing states

This issue will be solved for the next minor release.
A.1 CHANGE LOG

A.1.1 Release 5.2

A.1.1.1 NEW SYMBOLS

Valves
- “VG Non-Monitored Valve”
- “VG On-Off 2-way Valve”
- “VG On-Off 2-way Angle Valve”
- “VC 2-way Control Valve”
- “VK 2-way Checking Valve”
- “VG On-Off 3-way Bottom Inlet Valve”
- “VG On-Off 3-way Side Inlet Valve”
- “VG On-Off 4-way Valve”
- “VR Relief Device”
- “VR Safety Valve”
- “VR Relief Valve”
- “VG 3-way Bottom Inlet Control Valve”
- “VG 3-way Side Inlet Control Valve”
- “VC Self-contained Pressure Reduction Regulator”
- “VC On-Off 2-way Hand Valve”
- “VC On-Off 2-way Pneumatic Valve”
- “VC On-Off 3-way Pneumatic Bottom Inlet Valve”
- “VC On-Off 3-way Pneumatic Side Inlet Valve”
- “VC On-Off 2-way Control Valve”
- “VC On-Off 3-way Control Bottom Inlet Valve”
- “VC On-Off 3-way Control Side Inlet Valve”

Pumps
- “PL General Pump”
- “PL Positive Displacement Pump”
- “PV Vacuum Pump”
- “PV Root Vacuum Pump”
- “PV Scroll Vacuum Pump”
- “PV Screw Vacuum Pump”
- “PV Turbo molecular Vacuum Pump”
- “PV Cryo Pump”
- “PV Ion Pump”
- “PV Getter Pump”

Heat_Exchangers
- “HT Electrical Heater”

Miscellaneous
- “CE Turbo Alternator”

Actuators
- “AT Rotary Motor Actuator”

A.1.1.2 UPDATED SYMBOLS

Separators
- “DS Separator General”

A.1.1.3 REPLACED SYMBOLS

"2 way-Valves On-Off Off" Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
"2 way-Valves On-Off On" Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
"3-Positions 2 way-Valves 0" Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
"3-Positions 2 way-Valves 1" Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
"3-Positions 2 way-Valves 2" Replaced by Fluid Valves “VG On-Off 2-way Valve 2”
2 way-Valves On-Off Gate Construction Off  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
2 way-Valves On-Off Gate Construction On”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Gate Construction 0”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
3-Positions 2 way-Valves Gate Construction 1”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Gate Construction 2”  Replaced by Fluid Valves “VG On-Off 2-way Valve 2”
2 way-Valves On-Off Globe Construction Off”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
2 way-Valves On-Off Globe Construction On”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Globe Construction 0”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
3-Positions 2 way-Valves Globe Construction 1”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Globe Construction 2”  Replaced by Fluid Valves “VG On-Off 2-way Valve 2”
2 way-Valves On-Off Plug Construction Off”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
2 way-Valves On-Off Plug Construction On”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Plug Construction 0”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
3-Positions 2 way-Valves Plug Construction 1”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Plug Construction 2”  Replaced by Fluid Valves “VG On-Off 2-way Valve 2”
2 way-Valves On-Off Ball Construction Off”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
2 way-Valves On-Off Ball Construction On”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Ball Construction 0”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
3-Positions 2 way-Valves Ball Construction 1”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Ball Construction 2”  Replaced by Fluid Valves “VG On-Off 2-way Valve 2”
2 way-Valves On-Off Diaphragm Construction Off”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
2 way-Valves On-Off Diaphragm Construction On”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Diaphragm Construction 0”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
3-Positions 2 way-Valves Diaphragm Construction 1”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Diaphragm Construction 2”  Replaced by Fluid Valves “VG On-Off 2-way Valve 2”
2 way-Valves On-Off Butterfly Construction Off”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
2 way-Valves On-Off Butterfly Construction On”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Butterfly Construction 0”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
3-Positions 2 way-Valves Butterfly Construction 1”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
3-Positions 2 way-Valves Butterfly Construction 2”  Replaced by Fluid Valves “VG On-Off 2-way Valve 2”
2 way-Valves On-Off Butterfly Off”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
2 way-Valves On-Off Butterfly On”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
2 way-Valves On-Off Butterfly with Flanges Off”  Replaced by Fluid Valves “VG On-Off 2-way Valve 0”
2 way-Valves On-Off Butterfly with Flanges On”  Replaced by Fluid Valves “VG On-Off 2-way Valve 1”
2 way-Valves On-Off Angle Off”  Replaced by Fluid Valves “VG On-Off 2-way Angle Valve 0”
2 way-Valves On-Off Angle On”  Replaced by Fluid Valves “VG On-Off 2-way Angle Valve 0”
3-Positions 2 way-Valves Angle 0”  Replaced by Fluid Valves “VG On-Off 2-way Angle Valve 0”
3-Positions 2 way-Valves Angle 1”  Replaced by Fluid Valves “VG On-Off 2-way Angle Valve 0”
3-Positions 2 way-Valves Angle 2”  Replaced by Fluid Valves “VG On-Off 2-way Angle Valve 1”
2 way-Valves On-Off Angle Globe Off”  Replaced by Fluid Valves “VG On-Off 2-way Angle Valve 0”
2 way-Valves On-Off Angle Globe On”  Replaced by Fluid Valves “VG On-Off 2-way Angle Valve 0”
3-Positions 2 way-Valves Angle Globe 0”  Replaced by Fluid Valves “VG On-Off 2-way Angle Valve 0”
3-Positions 2 way-Valves Angle Globe 1”  Replaced by Fluid Valves “VG On-Off 2-way Angle Valve 0”
3-Positions 2 way-Valves Angle Globe 2”  Replaced by Fluid Valves “VG On-Off 2-way Angle Valve 0”
2 way-Valves Control ”  Replaced by Fluid Valves “VC 2-way Control Valve 0”
2 way-Valves Control Gate Construction ”  Replaced by Fluid Valves “VC 2-way Control Valve 0”
“2 way-Valves Control Globe Construction” Replaced by Fluid Valves “VC 2-way Control Valve 0”
“2 way-Valves Control Needle Construction” Replaced by Fluid Valves “VC 2-way Control Valve 0”
“2 way-Valves Control Plug Construction” Replaced by Fluid Valves “VC 2-way Control Valve 0”
“2 way-Valves Control Ball Construction” Replaced by Fluid Valves “VC 2-way Control Valve 0”
“2 way-Valves Control Diaphragm Construction” Replaced by Fluid Valves “VC 2-way Control Valve 0”
“2 way-Valves Control Butterfly Construction” Replaced by Fluid Valves “VC 2-way Control Valve 0”
“2 way-Valves Checking” Replaced by Fluid Valves “VK 2-way Checking Valve 0”
“2 way-Valves Lift Check” Replaced by Fluid Valves “VK 2-way Checking Valve 0”
“3 way-Valves On-Off” Inlet Valve 0”
“3 way-Valves On-Off Off” Inlet Valve 0”
“3 way-Valves On-Off On” Inlet Valve 1”
“3 way-Valves On-Off Glob Construction” Inlet Valve 0”
“3 way-Valves On-Off Glob Construction Off” Inlet Valve 0”
“3 way-Valves On-Off Glob Construction On” Inlet Valve 1”
“3 way-Valves On-Off Ball Construction” Inlet Valve 0”
“3 way-Valves On-Off Ball Construction Off” Inlet Valve 0”
“3 way-Valves On-Off Ball Construction On” Inlet Valve 1”
“4 way-Valves On-Off” Replaced by Fluid Valves “VG On-Off 4-way Valve 0”
“4 way-Valves On-Off Off” Replaced by Fluid Valves “VG On-Off 4-way Valve 0”
“4 way-Valves On-Off On” Replaced by Fluid Valves “VG On-Off 4-way Valve 1”
“Relief Devices” Replaced by Fluid Valves “VR Relief Device 1”
“Safety Valve” Replaced by Fluid Valves “VR Safety Valve 1”
“Relief Valve” Replaced by Fluid Valves “VR Relief Valve 1”
“3 way-Valves Control” Replaced by Fluid Valves “VG 3-way Bottom Inlet Valve 0”
“3 way-Valves Control Angle Relief Globe Valve” Replaced by Fluid Valves “VG 3-way Bottom Inlet Valve 0”
“3 way-Valves Control Automatic Recirculation Valve” Replaced by Fluid Valves “VG 3-way Bottom Inlet Valve 0”
“3 way-Valves Control Flow Balancing Valve” Replaced by Fluid Valves “VG 3-way Bottom Inlet Valve 0”
“General” Replaced by Fluid Pumps “PL General Pump 0”
“General Off” Replaced by Fluid Pumps “PL General Pump 0”
“General On” Replaced by Fluid Pumps “PL General Pump 1”
“Positive Displacement Pump” Replaced by Fluid Pumps “PL Positive Displacement Pump 0”
“Positive Displacement Pump Off” Replaced by Fluid Pumps “PL Positive Displacement Pump 0”
“Positive Displacement Pump On” Replaced by Fluid Pumps “PL Positive Displacement Pump 1”
“Centrifugal Pump” Replaced by Fluid Pumps “PL Positive Displacement Pump 0”
“Centrifugal Pump Off” Replaced by Fluid Pumps “PL Positive Displacement Pump 0”
"Centrifugal Pump On"  Replaced by Fluid Pumps “PL Positive Displacement Pump 1"  
"Gear Pump "  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Gear Pump Off"  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Gear Pump On”  Replaced by Fluid Pumps “PL Positive Displacement Pump 1"  
"Screw Pump "  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Screw Pump Off"  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Screw Pump On”  Replaced by Fluid Pumps “PL Positive Displacement Pump 1"  
"Helical Rotor pump "  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Helical Rotor pump Off"  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Helical Rotor pump On"  Replaced by Fluid Pumps “PL Positive Displacement Pump 1"  
"Liquid Jet Pump ”  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Liquid Jet Pump Off"  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Liquid Jet Pump On”  Replaced by Fluid Pumps “PL Positive Displacement Pump 1"  
"Diaphragm Pump ”  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Diaphragm Pump Off"  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Diaphragm Pump On”  Replaced by Fluid Pumps “PL Positive Displacement Pump 1"  
"Dosing Pump ”  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Dosing Pump Off”  Replaced by Fluid Pumps “PL Positive Displacement Pump 0"  
"Dosing Pump On”  Replaced by Fluid Pumps “PL Positive Displacement Pump 1"  
"Electrical Heater ”  Replaced by Fluid Heat_Exchangers “HT Electrical Heater Off”  
"Turbo Alternator "  Replaced by Fluid Miscellaneous “CE Turbo Alternator Off”  
"Rotary Motor Actuator "  Replaced by Fluid Actuators “AT Rotary Motor Actuator Off”  
"Single Acting Control Off”  Replaced by Fluid Valves “VC On-Off 2-way Control Valve 0”  
"Self-contained Pressure Reduction Regulator Off”  Replaced by Fluid Valves “VC Self-contained Pressure Reduction Regulator 0”  
"2 way-Valves On-Off Hand Valve Off”  Replaced by Fluid Valves “VC On-Off 2-way Hand Valve 0”  
"2 way-Valves On-Off Hand Valve On”  Replaced by Fluid Valves “VC On-Off 2-way Hand Valve 1”  
"3-Positions 2 way-Valves Hand Valve 0”  Replaced by Fluid Valves “VC On-Off 2-way Hand Valve 0”  
"3-Positions 2 way-Valves Hand Valve 1”  Replaced by Fluid Valves “VC On-Off 2-way Hand Valve 1”
"3-Positions 2 way-Valves Hand Valve 2" Replaced by Fluid Valves “VC On-Off 2-way Hand Valve 2”
"2 way-Valves On-Off Pneumatic Valve Off" Replaced by Fluid Valves “VC On-Off 2-way Pneumatic Valve 0”
"2 way-Valves On-Off Pneumatic Valve On" Replaced by Fluid Valves “VC On-Off 2-way Pneumatic Valve 1”
"3-Positions 2 way-Valves Pneumatic Valve 0" Replaced by Fluid Valves “VC On-Off 2-way Pneumatic Valve 0”
"3-Positions 2 way-Valves Pneumatic Valve 1" Replaced by Fluid Valves “VC On-Off 2-way Pneumatic Valve 1”
"3-Positions 2 way-Valves Pneumatic Valve 2" Replaced by Fluid Valves “VC On-Off 2-way Pneumatic Valve 2”
"2 way-Valves On-Off Control Valve Off" Replaced by Fluid Valves “VC On-Off 2-way Control Valve 0”
"2 way-Valves On-Off Control Valve On" Replaced by Fluid Valves “VC On-Off 2-way Control Valve 1”
"3-Positions 2 way-Valves Control Valve 0" Replaced by Fluid Valves “VC On-Off 2-way Control Valve 0”
"3-Positions 2 way-Valves Control Valve 1" Replaced by Fluid Valves “VC On-Off 2-way Control Valve 1”
"3-Positions 2 way-Valves Control Valve 2" Replaced by Fluid Valves “VC On-Off 2-way Control Valve 2”
"3 way-Valves On-Off Control Valve Off" Replaced by Fluid Valves “VC On-Off 3-way Control Bottom Inlet Valve 0”
"3 way-Valves On-Off Control Valve On" Replaced by Fluid Valves “VC On-Off 3-way Control Bottom Inlet Valve 1”
"Vacuum Pump" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Vacuum Pump Off" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Vacuum Pump On" Replaced by Fluid Pumps “PV Vacuum Pump 1”
"Positive-displacement Vacuum Pump" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Positive-displacement Vacuum Pump Off" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Positive-displacement Vacuum Pump On" Replaced by Fluid Pumps “PV Vacuum Pump 1”
"Diaphragm Vacuum Pump" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Diaphragm Vacuum Pump Off" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Diaphragm Vacuum Pump On" Replaced by Fluid Pumps “PV Vacuum Pump 1”
"Piston Vacuum Pump" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Piston Vacuum Pump Off" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Piston Vacuum Pump On" Replaced by Fluid Pumps “PV Vacuum Pump 1”
"Roots Vacuum Pump" Replaced by Fluid Pumps “PV Root Vacuum Pump 0”
"Roots Vacuum Pump Off" Replaced by Fluid Pumps “PV Root Vacuum Pump 0”
"Roots Vacuum Pump On" Replaced by Fluid Pumps “PV Root Vacuum Pump 1”
"Scroll Vacuum Pump" Replaced by Fluid Pumps “PV Scroll Vacuum Pump 0”
"Scroll Vacuum Pump Off" Replaced by Fluid Pumps “PV Scroll Vacuum Pump 0”
"Scroll Vacuum Pump On" Replaced by Fluid Pumps “PV Scroll Vacuum Pump 1”
"Screw Vacuum Pump" Replaced by Fluid Pumps “PV Screw Vacuum Pump 0”
"Screw Vacuum Pump Off" Replaced by Fluid Pumps “PV Screw Vacuum Pump 0”
"Screw Vacuum Pump On" Replaced by Fluid Pumps “PV Screw Vacuum Pump 1”
"Rotary Vane Vacuum Pump" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Rotary Vane Vacuum Pump Off" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Rotary Vane Vacuum Pump On" Replaced by Fluid Pumps “PV Vacuum Pump 1”
"Liquid Ring Vacuum Pump" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Liquid Ring Vacuum Pump Off" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Liquid Ring Vacuum Pump On" Replaced by Fluid Pumps “PV Vacuum Pump 1”
"Kinetic Vacuum Pump" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Kinetic Vacuum Pump Off" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Kinetic Vacuum Pump On" Replaced by Fluid Pumps “PV Vacuum Pump 1”
"Ejector Vacuum Pump" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Ejector Vacuum Pump Off" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Ejector Vacuum Pump On” Replaced by Fluid Pumps “PV Vacuum Pump 1”
"Diffusion Vacuum Pump" Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Diffusion Vacuum Pump Off” Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Diffusion Vacuum Pump On” Replaced by Fluid Pumps “PV Vacuum Pump 1”
"Turbo molecular Vacuum Pump" Vacuum Pump 0” Replaced by Fluid Pumps “PV Turbo molecular Vacuum Pump 0”
"Turbo molecular Vacuum Pump Off" Vacuum Pump 0” Replaced by Fluid Pumps “PV Turbo molecular Vacuum Pump 0”
"Turbo molecular Vacuum Pump On” Vacuum Pump 1” Replaced by Fluid Pumps “PV Turbo molecular Vacuum Pump 1”
"Turbo molecular drag Vacuum Pump" Vacuum Pump 0” Replaced by Fluid Pumps “PV Turbo molecular drag Vacuum Pump 0”
"Turbo molecular drag Vacuum Pump Off” Vacuum Pump 0” Replaced by Fluid Pumps “PV Turbo molecular drag Vacuum Pump 0”
"Turbo molecular drag Vacuum Pump On” Vacuum Pump 1” Replaced by Fluid Pumps “PV Turbo molecular drag Vacuum Pump 1”
"Entrapment Vacuum Pump” Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Entrapment Vacuum Pump Off” Replaced by Fluid Pumps “PV Vacuum Pump 0”
"Entrapment Vacuum Pump On” Replaced by Fluid Pumps “PV Vacuum Pump 1”
"Air Circulator” Replaced by Fluid Pumps “PV Vacuum Pump 0”