Process Valves
Symbols / Icons for Planners, Designers and Piping Engineers
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New logical symbols for process valves
Following many requests by plant designers and engineers to obtain a list of symbols for process valves we have looked into the host of available norms and printed data concerning this topic and established this document. We found out that although a large number of symbols exist in the various norms they are only particularly suited to the relevant area of application of the norm (e.g. norm for fire safety installations DIN 19 227 part 2, norm for thermal electric stations DIN 2481 and EN ISO 10 628 flow chart for process plant). In some cases different icons are used for one and the same valve type and actuator. For this reason this system of symbols has been developed to particularly meet the requirements of plant engineering and process valve systems and to suit their relevant applications.

Versions
The symbols will also be made available in electronic form in future to support CAD systems. For workshops and sites they will also be available on a shrink-wrapped memo card. The electronic version is expected to be available in summer 2004.

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Legend / File names / GB

**Valve type**

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<th>Valve type</th>
<th>Actuator</th>
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</thead>
<tbody>
<tr>
<td>Globe valve - straight seat</td>
<td>VGS</td>
</tr>
<tr>
<td>Globe valve - angle seat</td>
<td>VGA</td>
</tr>
<tr>
<td>Globe valve - multi-port</td>
<td>VGM</td>
</tr>
<tr>
<td>Globe valve - angled design</td>
<td>VGC</td>
</tr>
<tr>
<td>Globe valve - angle seat</td>
<td>MH</td>
</tr>
<tr>
<td>Diaphragm valve - straight through</td>
<td>VDS</td>
</tr>
<tr>
<td>Diaphragm valve - tank mounting</td>
<td>VDB</td>
</tr>
<tr>
<td>Diaphragm valve - angled design</td>
<td>VDC</td>
</tr>
<tr>
<td>Diaphragm valve - T-design</td>
<td>VDT</td>
</tr>
<tr>
<td>Diaphragm valve - full bore</td>
<td>VDFS</td>
</tr>
<tr>
<td>Ball valve - straight through</td>
<td>VBS</td>
</tr>
<tr>
<td>Ball valve - multi-port / T-passage</td>
<td>VBM_T</td>
</tr>
<tr>
<td>Ball valve - multi-port / L-passage</td>
<td>VBM_L</td>
</tr>
<tr>
<td>Butterfly valve - straight through</td>
<td>VBFS</td>
</tr>
<tr>
<td>Swing check valve</td>
<td>VBFS_PO</td>
</tr>
<tr>
<td>Gate valve - straight through</td>
<td>VGAS</td>
</tr>
<tr>
<td>Pinch valve - straight through</td>
<td>VHS</td>
</tr>
<tr>
<td>Plug valve - straight through</td>
<td>VPS</td>
</tr>
<tr>
<td>Plug valve - multi-port / “T-passage”</td>
<td>VPM_T</td>
</tr>
<tr>
<td>Plug valve - multi-port / “L-passage”</td>
<td>VPM_L</td>
</tr>
<tr>
<td>Gate valve - straight through</td>
<td>00</td>
</tr>
<tr>
<td>Pinch valve - straight through</td>
<td>10</td>
</tr>
<tr>
<td>Plug valve - straight through</td>
<td>20</td>
</tr>
<tr>
<td>Plug valve - multi-port / “T-passage”</td>
<td>30</td>
</tr>
<tr>
<td>Plug valve - multi-port / “L-passage”</td>
<td>61</td>
</tr>
<tr>
<td>Gate valve - straight through</td>
<td>62</td>
</tr>
<tr>
<td>Pinch valve - straight through</td>
<td>63</td>
</tr>
<tr>
<td>Plug valve - straight through</td>
<td>64</td>
</tr>
<tr>
<td>Plug valve - multi-port / “T-passage”</td>
<td>65</td>
</tr>
<tr>
<td>Plug valve - multi-port / “L-passage”</td>
<td></td>
</tr>
</tbody>
</table>

**Actuator**

- Manual, hand operated
- Manual, gear operated
- Electro-solenoid
- Pneumatic, piston controlled
- Pneumatic, membrane controlled
- Hydraulic, piston controlled
- Hydraulic, membrane controlled
- Operated by electric motor

**Control function**

- 00 Manual operation
- 10 Normally closed
- 20 Normally open
- 30 Double acting
- 61 Motorized
- 62 Motorized with position sensor
- 63 Motorized with position controller
- 64 Motorized with process controller
- 65 Motorized with process controller and field bus connection
Symbols for process valves

Piping

Valve

General symbol for straight through valves independent of the valve type and type of operation

- Sitzventil Geradesitz 2_2_D
- Sitzventil Schrägsitz 2_2_D
- Sitzventil Mehrwege 3_2_M
- Sitzventil Eckausführung 2_2_E
- Membranventil 2_2_D
- Membranventil Behältereinsatz 2_2_B
- Membranventil Eckausführung 2_2_E
- Membranventil Mehrwege 3_2_T
- Membranventil Mehrwege 3_2_L
- Membranventil Mehrwege 3_2_T
- Membranventil Mehrwege 3_2_L
- Membranventil Mehrwege 3_2_T
- Membranventil Mehrwege 3_2_L

- Kugelventil 2_2_D
- Kugelventil Mehrwege 3_2_T
- Kugelventil Mehrwege 3_2_L
- Kugelventil Mehrwege 3_2_T
- Kugelventil Mehrwege 3_2_L
- Kugelventil Mehrwege 3_2_T
- Kugelventil Mehrwege 3_2_L

- Klappenventil 2_2_D
- Klappenventil Mehrwege 3_2_T
- Klappenventil Mehrwege 3_2_L
- Klappenventil Mehrwege 3_2_T
- Klappenventil Mehrwege 3_2_L

- Rückschlagklappe 2_2_D
- Swing check valve 2_2_D
- Swing check valve 2_2_D

- Schieberventil 2_2_D
- Gate valve 2_2_D

- Schlauchquetschventil 2_2_D
- Pinch valve 2_2_D

- Kühlmittelventil 2_2_D
- Kühlmittelventil Mehrwege 3_2_T
- Kühlmittelventil Mehrwege 3_2_L
- Kühlmittelventil Mehrwege 3_2_T
- Kühlmittelventil Mehrwege 3_2_L

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Symbols for process valves
Symbols for valve actuators

Manual actuator
"Manually operated"
"Manually operated by gear/servo"

Pneumatic/Hydraulic actuator, piston controlled
"Normally closed"
"Normally open"
"Double acting"

Pneumatic/Hydraulic actuator, membrane controlled
"Normally closed"
"Normally open"
"Double acting"

Motorized actuator electric
"AC/DC"
"AC/DC with position feedback"

Type of voltage and level must be noted in the motorized actuator symbol (e.g. DC / 24 V)

Motorized actuator electric with integrated controller
"AC/DC with position controller"
"AC/DC with position and process controller"
"AC/DC with position and process controller and field bus"

Type of voltage and level must be noted in the motorized actuator symbol (e.g. DC / 24 V)

Solenoid actuator electric
"AC/DC - normally closed"
"AC/DC - normally open"
"AC/DC - double acting"

Type of voltage and level must be noted right of the solenoid actuator symbol (e.g. DC / 24 V)
Additional symbols

Symbols for flow direction and type of working medium
Left: gas, middle: steam, right: liquid

Symbols for valve actuator control lines and type of control medium.
Left: hydraulic, right: pneumatic

Symbol for locking device

Symbols for mechanical stroke limiters for valve actuators
Left: opening stroke, middle: closing stroke, right: opening and closing stroke

Symbols for electrical position indicators
Top line from left to right:
Both end positions, end position open, end position closed

Bottom line:
Switches as above, but with integrated optical position indicator
(mechanical or LED/light)

Field bus connections for pneumatic process valves.
Left: Electronic field bus connection, right: Electronic field bus connection with integrated pilot valve

Examples

Globe valve, flow against the seat, working medium steam, hydraulically operated piston actuator "normally closed" and electrical position indicator for both end positions, with optical indicator

Diaphragm valve with specified flow direction for liquid working media, pneumatic membrane controlled actuator "normally closed", manual override and stroke limiter for valve position "open" and electrical position indicator for end position "closed"

Butterfly valve with lockable manual operator
Position/Process controllers

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>P_E_IS</td>
<td>Position controller, electric Integrated in the motorized actuator or</td>
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<tr>
<td></td>
<td>for separate mounting</td>
</tr>
<tr>
<td>P_M_D</td>
<td>Position controller, electro-pneumatic With mechanical travel transmission</td>
</tr>
<tr>
<td></td>
<td>for direct mounting to the valve actuator</td>
</tr>
<tr>
<td>P_E_DS</td>
<td>Position controller, electro-pneumatic With electronic travel transmission</td>
</tr>
<tr>
<td></td>
<td>for direct mounting to the valve actuator or separate mounting</td>
</tr>
<tr>
<td>PC_IS</td>
<td>Process controller, electric Integrated in the motorized actuator or</td>
</tr>
<tr>
<td></td>
<td>for separate mounting</td>
</tr>
<tr>
<td>P_PC_M_D</td>
<td>Process controller, electro-pneumatic With mechanical travel transmission</td>
</tr>
<tr>
<td></td>
<td>for direct mounting to the valve actuator</td>
</tr>
<tr>
<td>P_PC_E_DS</td>
<td>Process controller, electro-pneumatic With electronic travel transmission</td>
</tr>
<tr>
<td></td>
<td>for direct mounting to the valve actuator or separate mounting</td>
</tr>
</tbody>
</table>

Examples

From left to right:
- Globe valve “double acting” with piston controlled actuator and directly mounted electro-pneumatic position controller with mechanical travel transmission (actual value/valve position)
- Diaphragm valve “normally closed” with membrane controlled actuator and directly mounted or separate electro-pneumatic position controller with electronic travel transmission.
- Globe valve “normally closed” with directly mounted position/process controller with integrated travel transmission.
Manual actuators

From left to right:
Gate valve, straight through, with lockable handwheel
Ball valve, 3 way design with “L-ball” and travel limitation on both sides (closing limiter) and an electrical position indicator for both end positions.

Piston controlled pneumatic/hydraulic actuators

From left to right:
Hydraulically operated pinch valve “normally closed” with stroke limiter in “closed” position”.
Pneumatic piston actuator “normally open” with integrated field bus connection.
Pneumatically operated piston actuator, “double acting” with manual override and electrical position indicator for “closed” end position.

Membrane controlled pneumatic/hydraulic actuators

From left to right:
Diaphragm valve, full bore design “normally closed”
“Normally open” with electrical position indicator for both end positions
“Double acting” with manual override and electrical position indicator for “open” end position

Electric solenoid actuator

Globe valve, straight through design. The solenoid is operated with 24 Volt DC. Normally closed actuator.

Electric motorized actuator

Butterfly valve, straight through design. The motorized actuator is operated with 24 Volt DC and has an integrated process controller with correcting variable output. The actuator/value can be connected to a field bus system.
Globe valves, straight seat 2/2 way straight through design

File name

Globe valve, straight manually operated
VGS_MH_00
control function
MG manual, gearbox / servo
SE solenoid
PP pneumatically operated by piston
PD pneumatically operated by membrane
ME motorized

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Globe valves, angle seat 2/2 way straight through design

VGA_MH_00

VGA_PP_10  VGA_PP_20  VGA_PP_30  VGA_SE_10  VGA_SE_20

VGA_PD_10  VGA_PD_20  VGA_PD_30

VGA_ME_61  VGA_ME_62  VGA_ME_63  VGA_ME_64

File name
globe valve, angle seat manually operated

VGA_MH_00
SE  control function
PP  solenoid
PD  pneumatically operated by piston
ME  pneumatically operated by membrane
motorized

Globe valves / double seat 3/2 way multi-port design

File name
- globe valve, multi-port manually operated
- VGM_MH_00 control function
- MG manual, gearbox / servo
- SE solenoid
- PP pneumatically operated by piston
- PD pneumatically operated by membrane
- ME motorized
Globe valves 2/2 way angled design

File name
- globe valve, angled design
- manually operated
- control function
- MG: manual, gearbox / servo
- SE: solenoid
- PP: pneumatically operated by piston
- PD: pneumatically operated by membrane
- ME: motorized

VGC_MH_00
VGC_MG_00
VGC_PP_10
VGC_PP_20
VGC_PP_30
VGC_SE_10
VGC_SE_20
VGC_PD_10
VGC_PD_20
VGC_PD_30
VGC_ME_61
VGC_ME_62
VGC_ME_63
VGC_ME_64
VGC_ME_65
Diaphragm valves 2/2 way straight through design

File name
- diaphragm valve, straight
- manually operated
- control function
- MG: manual, gearbox / servo
- SE: solenoid
- PP: pneumatically operated by piston
- PD: pneumatically operated by membrane
- ME: motorized

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VDS_PP_10
VDS_PP_20
VDS_PP_30
VDS_SE_10
VDS_SE_20
VDS_PD_10
VDS_PD_20
VDS_PD_30
VDS_ME_61
VDS_ME_62
VDS_ME_63
VDS_ME_64
VDS_ME_65

15
Diaphragm valves 2/2 way for tank mounting

VDB_MH_00
VDB_PP_10
VDB_PP_20
VDB_PP_30
VDB_PD_10
VDB_PD_20
VDS_PD_00
VDB_ME_61
VDB_ME_64
VDB_ME_62
VDB_ME_65
VDB_ME_63

File name
diaphragm valve for tanks
manually operated
control function
PP pneumatically operated by piston
PD pneumatically operated by membrane
ME motorized

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Diaphragm valves 2/2 way angled design

File name
Diaphragm valve, angled design
manually operated

VDC_MH_00
control function
pneumatically operated by piston
PP
pneumatically operated by membrane
PD
motorized
ME
Diaphragm valves 3/2 way
T design for feeding and outlet

File name: diaphragm valve, T design manually operated

VT_MH_00

PP
PD
ME

VT_PP_10

VT_PP_20

VT_PP_30

VT_PD_10

VT_PD_20

VT_PD_30

VT_ME_61

VT_ME_62

VT_ME_63

VT_ME_64

VT_ME_65

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Diaphragm valves 2/2 way
full bore, straight through design
Ball valves 2/2 way straight through design

File name
- ball valve, straight manually operated
- control function
  - manual, gearbox / servo
  - pneumatically operated by piston
  - motorized

VBS_MH_00
MG
PP
ME

VBS_MH_00
VBS_MG_00
VBS_PP_10
VBS_PP_20
VBS_PP_30

VBS_ME_61
VBS_ME_62
VBS_ME_63
VBS_ME_64
VBS_ME_65
Ball valves 3/2 way with T-passage, multi-port design

**File name**

- **VBM_T_MH_00**
- **MG**
- **PP**
- **ME**

- Ball valve, multi-port manually operated
- Control function
- Manual, gearbox / servo
- Pneumatically operated by piston motorized

"T"-passage

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Ball valves 3/2 way with L-passage, multi-port design

File name

- ball valve, multi-port
- manually operated
- control function
- manual, gearbox / servo
- pneumatically operated by piston
- motorized

“L”-passage

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Butterfly valves 2/2 way straight through design

File name
- butterfly valve, straight manually operated
- VBFS_MH_00 control function
  - MG manual, gearbox / servo
  - PP pneumatically operated by piston
  - ME motorized

VBFS_MH_00  VBFS_MG_00  VBFS_PP_10  VBFS_PP_20  VBFS_PP_30

VBFS_ME_61  VBFS_ME_62  VBFS_ME_63  VBFS_ME_64  VBF0_ME_65
Swing check valve 2/2 way straight through design

File name
Swing check valve, straight

VBFS_PO
control function pressure operated

VBFS_PO
Gate valves 2/2 way straight through design

File name:
- VGAS_MH_00: Gate valve, straight manually operated
- MG: control function
- PP: manual, gearbox / servo
- ME: pneumatically operated by piston motorized

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VGAS_MH_00  VGAS_MG_00  VGAS_PP_10  VGAS_PP_20  VGAS_PP_30

VGAS_PD_10  VGAS_PD_20  VGAS_PD_30

VGAS_ME_61  VGAS_ME_62  VGAS_ME_63  VGAS_ME_64  VGAS_ME_65
Pinch valves 2/2 way straight through design

File name
- Pinch valve, straight manually operated control function
  - VHS_MH_00
  - MG manual, gearbox / servo
  - PP pneumatically operated by piston
  - PD pneumatically operated by membrane
  - ME motorized

VHS_MH_00  VHS_PP_10  VHS_PP_20  VHS_PP_30
VHS_MG_00  VHS_PP_10  VHS_PP_20  VHS_PP_30
VHS_ME_61  VHS_ME_62  VHS_ME_63  VHS_ME_64  VHS_ME_65
Plug valves 2/2 way straight through design

File name

plug valve, straight manually operated

control function

manual, gearbox / servo

pneumatically operated by piston

motorized

VPS_MH_00

MG

PP

ME

VPS_ME_61

VPS_ME_62

VPS_ME_63

VPS_ME_64

VPS_ME_65
Plug valves 3/2 way with T- passage, multi-port design

File name
- plug valve, multi-port manually operated
- control function
- manual, gearbox / servo
- pneumatically operated by piston motorized

“T”-Passage

VPM_T MH_00
VPM_T MG_00
VPM_T PP_10
VPM_T PP_20
VPM_T PP_30
VPM_T ME_61
VPM_T ME_62
VPM_T ME_63
VPM_T ME_64
VPM_T ME_65
Plug valves 3/2 way with L- passage, multi-port design

---

File name

plug valve, multi-port manually operated
control function
manual, gearbox / servo
pneumatically operated by piston motorized

---

“L”-Passage

---

VPM_L_MH_00  VPM_L_MG_00  VPM_L_PP_10  VPM_L_PP_20  VPM_L_PP_30

---

VPM_L_ME_61  VPM_L_ME_62  VPM_L_ME_63  VPM_L_ME_64  VPM_L_ME_65
**Measurement devices**

**FM_gas:**
Flowmeter/variable area principle for gases 
(flow meter_gas)

**FM_liquid:**
Flowmeter/variable area principle for liquids 
(flow meter_liquid)

**EVS_max:**
Limit switch max. for volumetric flow Q 
(electrical_value_switch_max)

**EVS_min:**
Limit switch min. for volumetric flow Q 
(electrical_value_switch_min)

**measure_point:**
Measurement device without signal output for volumetric flow Q, pressure (p), differential pressure (delta p), pH-value (pH), temperature (T) or other physical variables.

**measure_point_S:**
Measurement device with signal output for volumetric flow Q, pressure (p), differential pressure (delta p), pH-value (pH), temperature (T) or other physical variables.

**Transmitter_point_S:**
Measuring transmitter with signal output for volumetric flow Q, pressure (p), differential pressure (delta p), pH-value (pH), temperature (T) or other physical variables.

**LT_F:**
Level transmitter with float 
(Level Transmitter_float)

**LT_US:**
Level transmitter with ultrasonic sensor 
(Level Transmitter_Ultrasonic)

**LT_R:**
Level transmitter with radar sensor 
(Level Transmitter_Radar)

**LD:**
Level detector limit switches. The number of 
"arrows" corresponds to the number of limiting values to be switched. 
(Level Detection)

**LS:**
Level switch
Manual valve operators

Valve with manual operator
“Directly manually operated”

Manual operator
“Manually operated by gear or servo operated”

Examples

From left to right:
Gate valve, straight through design with lockable manual operator
Ball valve, 3 way design with “L-ball” and travel stops on both sides (closing limit) and an electrical position indicator for both end positions.
Pneumatic/hydraulic piston controlled valve actuators

Process valve with pneumatic/hydraulic piston controlled actuator

“Normally closed”

Pneumatic/hydraulic valve actuator, piston controlled

“Normally open”

Pneumatic/hydraulic valve actuator, piston controlled

“Double acting”

Examples

Piston controlled pneumatic/hydraulic actuators

From left to right:

Hydraulically operated pinch valve “normally closed” with stroke limiter in “Closed” position.

Pneumatic piston actuator “normally open” with control air integrated field bus connection.

Pneumatically operated piston actuator “double acting” with manual override and electrical position indicator for “Closed” end position.
Pneumatic/hydraulic membrane controlled valve actuators

Process valve with pneumatic/hydraulic membrane controlled actuator

“Normally closed”

Pneumatic/hydraulic valve actuator, membrane controlled

“Normally open”

Pneumatic/hydraulic valve actuator, membrane controlled

“Double acting”

Examples

Membrane controlled pneumatic/hydraulic actuators

From left to right:

- Diaphragm valve, full bore design, “normally closed”.
- “Normally open” with electrical position indicator for both end positions.
- “Double acting” with manual override and electrical position indicator for “Closed” position.
Motorized valve actuators

AC = AC voltage
DC = DC voltage
Figure = volts

Process valve with motorized actuator, 230 V AC, for linear and quarter turn valves

Motorized valve actuator with integrated continuous position feedback (e.g. for actual value detection of valve position in control systems).

Motorized valve actuator with integrated position controller.

Motorized valve actuator with integrated position and process controller (e.g. for controlling volumetric flow).
Right illustration: With additional integrated field bus connection.
Electro-solenoid valve actuators

Electro-solenoid valve actuator (solenoid actuator)
“Normally closed”.

Electro-solenoid valve actuator (solenoid actuator)
“Normally open”.

Electro-solenoid valve actuator (solenoid actuator)
“Double acting”.

Examples

Plastic or metal globe valve with electro-solenoid operation, “normally closed”, 24 V DC.