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Pneumatic Control Unit RP 5340





Pneumatic Control Unit

Application

Pneumatic control unit (next CU only) RP 5340 is designed for control of spring loaded safety valves with additional pneumatic loading (next SV only) type SiZ 1508 and PV 1509, produced by LDM Ceska Trebova Co.Ltd., eventually other types of SV equipped with air cylinder. The CU type RP 5340 replaces still produced CU RP 5330, the main improvement is lower pressure air consumption and more easy opening pressure setting.

CU RP 5340 retains all useful functions as the previous type for an operator, especially a possibility to set opening pressure of CU not only during normal working condition of protected vessel but even in case of pressure vessel outage (without pressure inside it) without any further adjustment of pressure impulse piping and also setting of SV by the curve of relation between opening pressure on lifting air pressure (called setting by „K-linie“).

Description

Base of CU RP 5340 is robust steel frame, to which all equipment is fastened. Four anchor holes (thread M16) are bored into it, for fixing the unit on the wall, or other construction. The CU case serves as cover/protection against a damage, nonauthorised manipulation and influence of environment (dust, humidity...)

There are three pressure tapping line connections in the lower side of the unit (tube 33,7x5/(36x2), material 1.0425/1.0426/1.7335 (1.0577) for connection of pressure impulse pipe. CU is connected to three sampling points where each one of them can have a different value.

Connection of pressure air (thread M22x1,5, male), connector with cable for solenoid valve control (230V/50Hz) and 2 outputs for lifting and 2 outputs for loading air (thread M27x1,5, male) are placed on upper side of the unit. The feeding air has to be supplied to the unit continuously. It is possible to control the unit remotely if the solenoid valve is connected to the control board. It allows to connect the unit to the protected device control system and to open safety valves from the operator office (for example for the check of function and monitoring exhaust during operation of protected device). Through lifting and loading air connections is CU linked with safety valves pneumatic cylinder.

Permissible ambient temperature for reliable CU operation is in range 0 to +60 degC. Designs for temperatures below 0 degC are offered as option (additional heating unit).

Prior dispatching, the CU is tested and set pressure is adjusted according the order. This setting is sealed.

Operation

The control unit operates connected safety valve by pressure air (lifting and loading). It increases the sealing force on the plug before the opening overpressure is reached. Better valve tightness and long service life is provided by this way. Then, after the adjusted opening overpressure is reached, control unit opens the valve to full lift instantly. When the pressure drops again, the control unit rapidly closes the valve and increases the pressing force on the plug. One control unit can operate max. two safety valves.

Pressure air, necessary for operation of CU is taken from pressure air connection (12) through On-Off ball valve (13) and main reduction valve with filter (14). The pressure is reduced to 4 barg. Through lifting air pipeline (37) is the air supplied below the piston of pneumatic cylinder (3). Control air goes through fine filter (17), is reduced to 1,4 barg in the reducing valve (16) and is supplied to the air nozzles (21). Until the control flags (11) of coil springs (10) brake the air flow between the nozzles, the control air is supplied into three diaphragm valves (22) and keeps them closed. Thus, the air passing through the orifice (23) and loading air pipeline (38) can reach the pressure 4 barg (i.e. the same pressure as lifting air). Differential piston of pressure air cylinder (3) of SV type SiZ 1508 has a larger effective area in the closing direction and so, in the normal state, the piston acts with additional sealing force to the plug of SV (2). With the SV type PV 1509 a differential piston is replaced by dual piston in which the loading air acts to two areas and the lifting air acts to the one area only.

When the pressure in protected device (1) is increased above the adjusted value, the coil springs (10) are deformed and their control flags (11) get the position between air nozzles (21). Flow of control air is interrupted, which causes a pressure relief in diaphragm valves (22). Diaphragm valves (22) open and loading air from the space above the piston of air pressure cylinder (3) blows off into atmosphere. As a result of it, the safety valve (2) opens to full lift in a very short time because the lifting air acting on the lower side of the piston of air pressure cylinder (3) increases the opening force.

Opening of the SV (2) causes pressure drop in the protected device. Subsequently, the coil springs (10) move contrary and control flags (11) protrude back from the spot between the air nozzles (21). Flow of control air is re-created, which causes increasing of air pressure in diaphragm valves (22) and their closure. The supply of loading air above the piston of air pressure cylinder (3) is restored, which causes rapid closing of safety valve (2).

Air quality demands

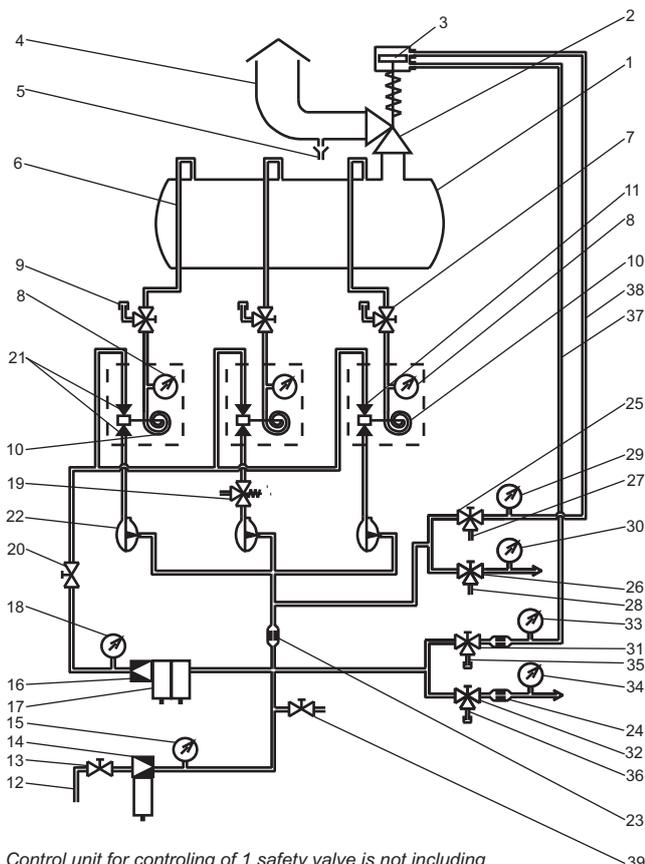
The quality of air, supplied into CU, has to fulfill the demands of ČSN ISO 8573-1 standard:

- solid particles class 4 or better (max. size 15 µm, max. quantity 8 mg/m³)
- water class 4 or better (condensation point +3°C)
- oil class 3 or better (max. 1 mg/m³ dust)

Diagram of RP 5340

HP Circuit

- 1) Protected Vessel
- 2) Safety Valve
- 3) Air cylinder piston
- 4) Outlet Pipeline
- 5) Drainage
- 6) Pressure Tapping Line
- 7) 3-way On-Off Valve
- 8) Tapping Line Gauge
- 9) High Pressure External Source Connection
- 10) Bourdon Spiral
- 11) Control Orifice



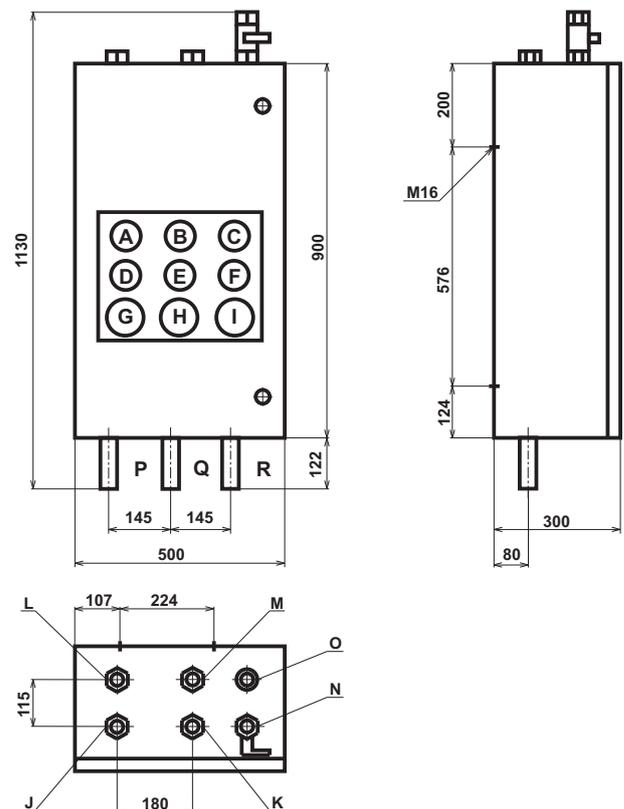
Control unit for controlling of 1 safety valve is not including this positions: 26, 28, 30, 32, 34, 36 a D, E, L, M.

Dimensions, position of fixing points and pipe connection

- | | |
|-------|--|
| A | Lifting Air Pressure Gauge (1 st SV) |
| B | Loading Air Pressure Gauge (1 st SV) |
| C | Operating Air Pressure Gauge |
| D | Lifting Air Pressure Gauge (2 nd SV) |
| E | Loading Air Pressure Gauge (2 nd SV) |
| F | Control Air Pressure Gauge |
| G | Tapping Line Gauge nr.1 |
| H | Tapping Line Gauge nr.2 |
| I | Tapping Line Gauge nr.3 |
| J,K | Lifting/loading air of 1 st SV (thread M27x1,5) |
| L,M | Lifting/loading air of 2 nd SV (thread M27x1,5) |
| N | Operating air On-Off Valve |
| O | Remote Control connection |
| P,Q,R | Tapping line connection (tube 32x6, material steel 1.0570) |

LP Circuit

- 12) Air pressure Connection
- 13) On-Off ball valve
- 14) Main Pressure Reducing Valve (6 4 barg) with Air Filter (5µm)
- 15) Operating Air Pressure Gauge
- 16) Control Air Pressure Reducing Valve (4 1,4 barg)
- 17) Fine Air Filter (0,01µm)
- 18) Control Air Pressure Gauge
- 19) 3-way On-Off Solenoid Valve (SV Remote Control)
- 20) 2-way On-Off Ball Valve
- 21) Air jets
- 22) Diaphragm Valve
- 23) Loading Air Orifice
- 24) Lifting Air Orifice
- 25) Loading Air 3-way On-Off Valve (1st SV)
- 26) Loading Air 3-way On-Off Valve (2nd SV)
- 27) Loading Air Release (1st SV)
- 28) Loading Air Release (2nd SV)
- 29) Loading Air Pressure Gauge (1st SV)
- 30) Loading Air Pressure Gauge (2nd SV)
- 31) Lifting Air 3-way On-Off Valve (1st SV)
- 32) Lifting Air 3-way On-Off Valve (2nd SV)
- 33) Lifting Air Pressure Gauge (1st SV)
- 34) Lifting Air Pressure Gauge (2nd SV)
- 35) Lifting Air Release/External pressure source connection (1st SV)
- 36) Lifting Air Release/External pressure source connection (2nd SV)
- 37) Lifting Air Pipeline
- 38) Loading Air Pipeline
- 39) 2-way On-Off valve (Fine Lift Control, for Safety Valve Setting)





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