

gec-co Flow Control

Pressure maintenance for geothermal water systems



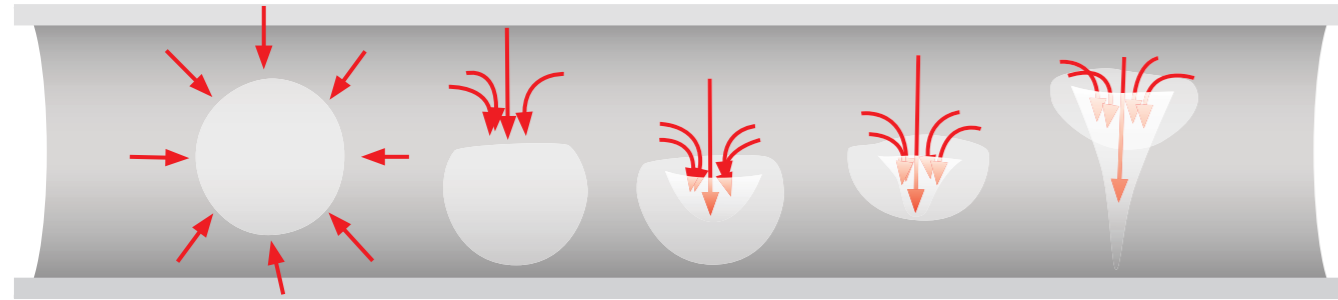
PRV-GT
Pressure retention valve

Supported by:



on the basis of a decision
by the German Bundestag

Challenges in geothermal water systems



CAVITATION

In geothermal water there are two types of cavitation, vapour cavitation (hard cavitation) and gas cavitation (soft cavitation). Both arise through a local drop in pressure as a result of pressure and velocity changes in the geothermal water and occur in components – especially in valves: Small vapour or gas bubbles form. If the pressure rises again, the bubbles implode in fractions of a second. The micro-jets produced hit the surrounding components of the geothermal water system and knock out material. As a result, valves and pipework suffer irreversible damage.

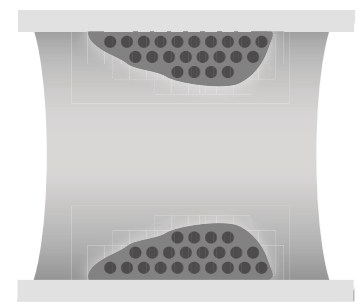
gec-co Flow Control doesn't allow cavitation to occur in the first place.



OUTGASSING

Deposits occur, among other things, due to outgassing. Gases present in the geothermal water are released in local negative pressure zones. In the geothermal water these gas bubbles form a two-phase flow. The consequences are damage to all flowconducting parts of the geothermal water loop.

gec-co Flow Control prevents outgassing and its consequential effects.



DEPOSITION

Pipe narrowing, a decrease in flow rate and increased power consumption through to component failure: In the event of a drop in pressure, dissolved particulate matter is deposited on fittings and pipes in the geothermal water and leads to component failure.

gec-co Flow Control keeps the pressure constant and reduces deposits.*

WEAR

Wear in the geothermal water system occurs due to abrasive substances in the geothermal water. In conventional valve designs this leads rapidly to a reduction in controllability through to complete failure.

gec-co Flow Control reduces wear.

CORROSION

Corrosion continues to pose challenges to the planners of geothermal water systems: Many components are only available in a limited selection of materials.

gec-co Flow Control ensures greater planning freedom.

Solutions for geothermal water loops

PRV-GT pressure retention valve

API CASING

Standard casing with no complex moulds for the valve casing.

VALVE BODY

Cavitation-free pressure drop via the physical principle of wall friction.

OUTLET

The guide vanes fitted ensure the valve is centred. They guarantee even flow and constant pressure.

CONTROL UNIT

The valve is controlled from above ground via a control rod (e.g. API tubing).

INLET ZONE

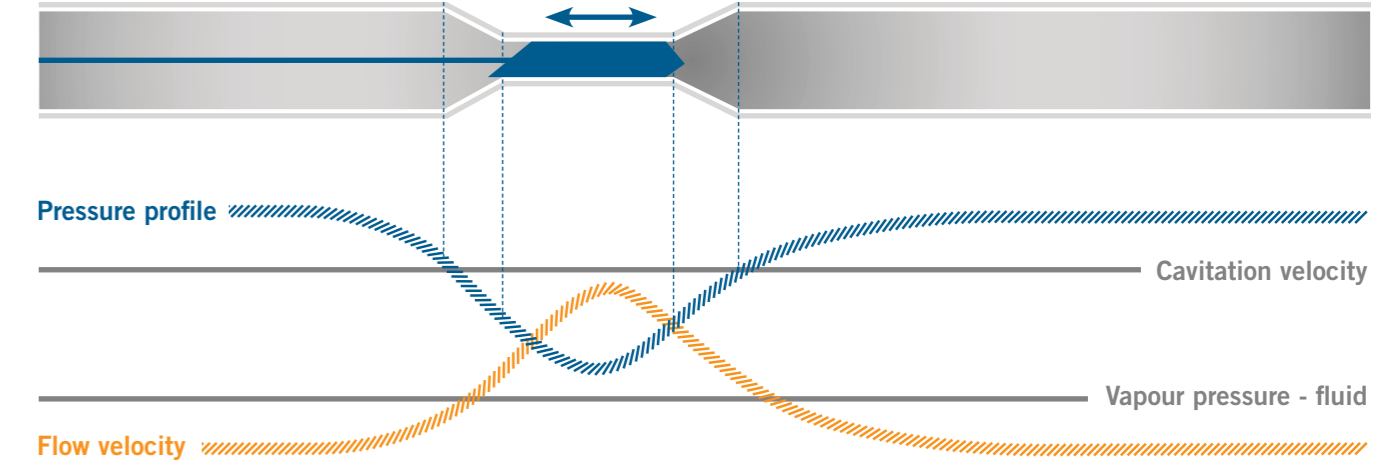
The flow is merged and its velocity increased in a controlled manner via the funnel.

OUTLET DIFFUSOR

Thanks to its convenient shape it protects against back flow and flow separation.

SAFETY DEVICE

Can be fitted as required.



Cavitation-free operation: gec-co Flow Control protects the valve and the fluid: The controllable valve guarantees pressure maintenance via the vapour pressure of the medium. At the same time, the flow velocity remains below the cavitation velocity.

CAVITATION

The PRV-GT pressure retention valve, specially developed by gec-co Flow Control for geothermal energy applications, ensures cavitation-free pressure reduction. A valve and axial discharge guarantee even pressure reduction and prevent local negative pressure zones. Thanks to pressure reduction via wall friction, the flow velocity of the fluid is below its cavitation velocity throughout the entire valve system.

WEAR

PRV-GT was designed in such a way that wear is compensated for during operation and the valve remains fully functional until the wear limit has been reached. The wear condition of the valve can be gauged from outside without it being removed.

REDUNDANCY

For geothermal energy plants, the continuous operation of the plant is extremely important. For this reason, the PRV-GT pressure retention valve can be configured redundantly. The second, or additional, valves are activated from above ground.

PRESSURE MAINTENANCE

gec-co Flow Control undertakes the complete design of pressure maintenance in the geothermal water system. In this way the PRV-GT pressure retention valve is optimally integrated into the entire system, with a surge tank for example.

OUTGASSING

The PRV-GT valve keeps the pressure above the gas release pressure throughout the entire geothermal water system. The valve reliably prevents outgassing and two-phase flows. It protects fittings and pipework. As a result, the heat transfer in the heat exchanger remains at an optimum level and the efficiency of the plant remains high.

DEPOSITION

The PRV-GT valve prevents depositions* thanks to constant pressure maintenance. By keeping the pressure level of the geothermal water loop above the release pressure of the particulate matter, trouble-free plant operation is guaranteed. Components function for longer, pipes and valves remain free of deposits. The valve thus ensures the efficient generation of energy.

MATERIAL SELECTION

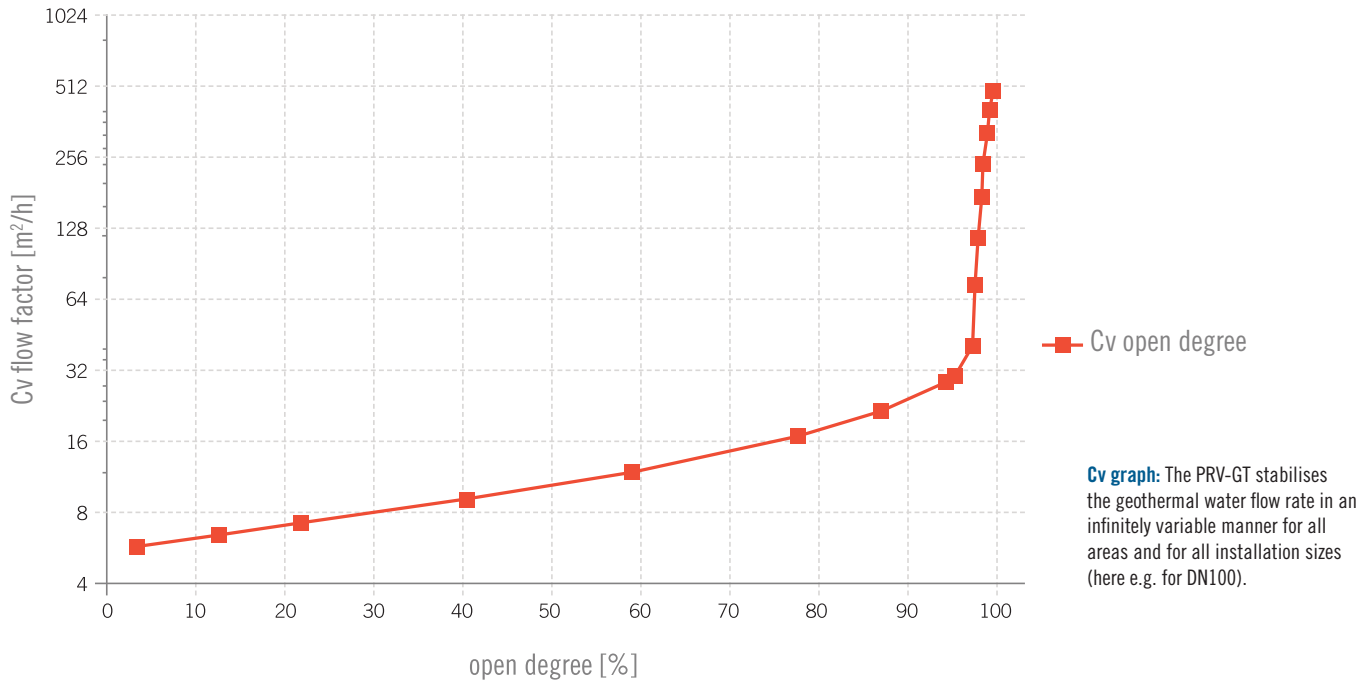
The PRV-GT pressure retention valve can be manufactured in a multiplicity of steels and alloys, thus enabling it to be adapted to the requirements of water chemistry in order to prevent or reduce corrosion.

* Deposits which can be affected by pressure.

Controllable above ground: gec-co Flow Control is fitted below the static water level (diagram).

Specifications

DN100 (Cv v open degree)



Features of PRV-GT

The PRV-GT is ideal for geothermal energy plants. With minimal noise, the pressure retention valve guarantees even, cavitation-free pressure reduction with pressure differences of up to 40 bar – at high temperatures and in aggressive geothermal waters or geothermal waters containing particulate matter. The flat characteristic curve in the operating range of the valve enables precise regulation of the entire plant. The principle behind the design of the pressure retention valve is the required pressure in the geothermal water loop. When the valve is fully opened, the PRV-GT facilitates high flow rates and low flow resistance. Due to its design characteristics, the valve can be adapted flexibly to the conditions of the plant.

Casing diameter/ Injection well	Injection line	Valve diameter	Valve length	Pressure maintenance/ pressure loss	Volume flow rate
< 5"	upon request				
5" – 9 7/8"	3 1/2" – 6 5/8"	2 1/2" – 5 1/2"	0,9 – 1.6 m	up to 40 bar	20 l/s – 50 l/s
10 3/4" – 13 5/8"	7 5/8" – 8 5/8"	6" – 7 5/8"	1,3 – 2.2 m	up to 40 bar	50 l/s – 100 l/s
14" – 20"	8 5/8" – 13 3/8"	7 5/8" – 11 3/4"	2 – 3.5 m	up to 40 bar	100 l/s – 200 l/s

Table 1: The figures are standard values. The valve is designed on the basis of actual operating conditions.

Valve sizes for applications in geothermal energy plants

The PRV-GT valve uses the materials already being utilised in the plant. It is fitted below ground at the end of the injection line approximately 100 metres below the static water level. The valve is operated via an actuating drive and a control rod. There is a choice of drive type (electrical, hydraulic, pneumatic). Standard systems are used for sealing the control rod on the wellhead. Redundant configuration of several valves behind one another is possible.

Your contact



Dipl.-Ing. (FH) Andreas Rauch

Team Manager – gec-co Flow Control

gec-co Global Engineering & Consulting-Company GmbH

Bürgermeister-Wegele-Straße 6

86167 Augsburg

Tel.: +49 821 / 56 993 00-36

e-mail: flow-control@gec-co.de

www.gec-co.de



gec-co
GLOBAL ENGINEERING & CONSULTING

gec-co – Complete solutions for deep geothermal energy

To adjust all components in such a way that an optimum overall system is created – that's the basic principle of successful deep geothermal energy extraction. Augsburg consulting engineers gec-co Global Engineering & Consulting Company GmbH, established in 2007, is the full-service supplier for the above-ground area of geothermal energy heating and power plants. gec-co's complete geothermal water technology service includes:

- The PRV-GT below-ground valve – controllable above-ground – for cavitation-free pressure maintenance in the geothermal water loop
- Pressure dimensioning in the geothermal water loop
- Mechanical flow calculations

Over 20 experienced staff from the fields of mechanical engineering and energy, environmental and process technology work for gec-co around the world as project managers on drilling and research projects and as consultants and designers. gec-co supports deep geothermal energy companies in operating their plants at maximum efficiency. IT, acceptance research and communication services round off the gec-co portfolio. The company is entrusted with the management of the industry association 'Wirtschaftsforum Geothermie e.V.' and coordinates political, research and media activities.

gec-co Global Engineering & Consulting-Company GmbH

gec-co Geothermal

Drill site construction
Power plant construction
Operational management
ORC/Kalina cycle calculation



gec-co Drilling Technology

Down hole tools
Pipe handler/pipe push unit
Vertical drilling equipment
Horizontal drilling equipment



gec-co Plant & Equipment

Mechanical and plant engineering and construction
Design and calculation
IPSEpro simulation program
Plant design in 3D



gec-co Flow Control

Pressure and volume control valves for water, hydraulics, the chemical industry, oil/natural gas
Special valve technology



gec-co Lobbying

Management of the industry association ('Wirtschaftsforum Geothermie e.V.')

- Position papers
- Political network
- Renewable energies



gec-co Energy Communication

Press and public relations activity
Corporate communication
Network of journalists
Acceptance research and management

