

Cooling Water Control Valves Gestramat®

Gestramat CW 41, CW 41/4

PN 16, DN 25 – 100 mm (1 – 4")

Description

The cooling-water control valves type CW are direct-acting proportional controllers for installation in cooling water or brine return lines. They ensure that the cooling-water outlet temperature is maintained at a preset value, calculated for the process requirements.

When using cooling-water control valves, higher temperatures are possible than with an uncontrolled process. As a result of the larger heat absorption by the cooling water or brine, cooling-agent and energy consumption are reduced.

In particular, in new plants where the installation of cooling-water control valves has been planned right from the beginning, capital costs are reduced. Due to the reduced coolant flow-rate, pipework, valves and pumps can be smaller. Furthermore, the cooling-water control valves type CW ensure an optimum distribution of the coolant to all heat exchangers which are installed in parallel.

The regulator of the CW 41 consists of one, two or three thermostats (3) (depending on the valve size) mounted in series within a double-seat valve cone (2). The upper cone closes tight whilst the lower one is designed with a tolerance to form a leak passage ("s" cone), or the leak passage is formed by a borehole in the cone ("r" cone).

The thermostats (3) contain an elastomer thermal expansion material ("n" and "k" thermostats) or wax ("w" thermostat). Under the influence of heat the volume of the thermostats increases, projecting a pin which is included in the thermostat body.

The lift of the thermostats is transmitted to the valve cone via the pin of setting device (6), supporting the thermostats. With rising cooling-water outlet temperature, the valve cone is moved in the opening direction against the force of the spring. When the temperature drops again the valve cone is moved by the spring (7.1) in the closing direction.

The position of the setting pin can be modified with the aid of adjusting key (11) to obtain higher or lower cooling-water outlet temperatures (see overleaf).

The continuous bleed flow guarantees a sensitive response even when the valve is closed. The bleed flow can be increased by screwing in setting screw (7.6).

Design

Standard design with pressure-gauge [0–6 bar (0–85 psi)], thermometer [–30 to +100 °C (–22 to +212 °F)], and setting device with removable adjusting key which fits all valve sizes.

At extra cost: For the use with brine, pressure gauge, thermometer and setting device provided with extensions.

Pressure/Temperature Rating

Max. service pressure 16 barg (230 psig)
Max. differential pressure 6 bar (85 psi)

Differential pressure

= **inlet** pressure minus **outlet** pressure

Temperature ratings see "Technical Data".

Materials

Body¹⁾ EN-GJS-400-18U-LT
(EN-JS 1049)

Internals made of materials for industrial cooling water (type CW 41).
On request at extra cost, also for salt water, ammoniacal water and chlorinated hydrocarbons (type CW 41/4).

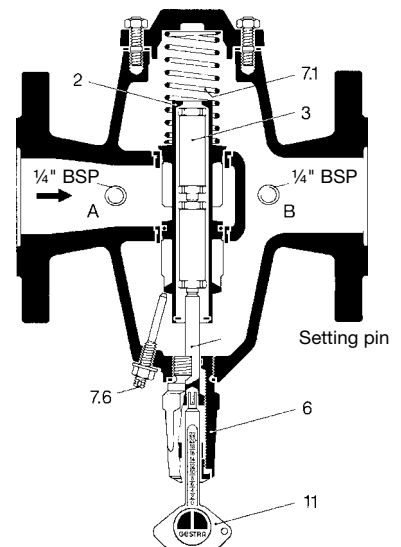
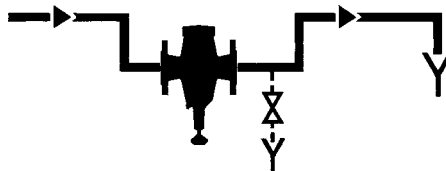
¹⁾ Old designation: GGG - 40.3 (0.7043)

Connections

Flanges to DIN 2533 (BS 4505) PN 16, Form C. On request at extra cost, flanges drilled to ASME 150.

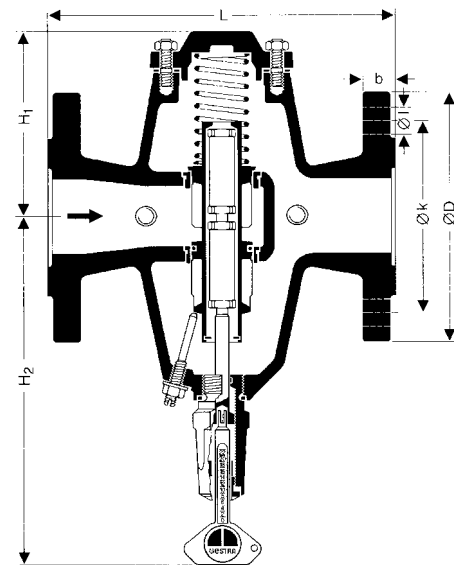
Installation

The cooling-water control valve should be installed in the cooling-water return line as close as possible to the heat exchanger, preferably in horizontal lines. Ensure that the adjusting key points downward and that the valve cannot drain empty (by providing a suitable pipe geometry, if necessary).



A = Pressure-gauge connection
B = Thermometer connection

CW 41 DN 40, 50 (1 1/2, 2")



Dimensions and Weights

DN	[mm] [in]	25 1	40 1 1/2	50 2	80 3	100 4
Dimensions in mm	L	160	200	230	310	350
	H ₁	97	128	128	166	166
	H ₂	216	255	255	316	316
Flange dimensions (DIN flanges) in mm	D	115	150	165	200	220
	b	16	18	20	22	24
	k	85	110	125	160	180
	l	14	18	18	18	18
Number of bolts		4	4	4	8	8
Approx. weight	[kg]	7	12	14	33	34

Valve Selection

1. Selection of Valve Type in accordance with Cooling Medium

Cooling medium	Valve type
Industrial cooling water	CW 41
Ammoniacal water, salt water, chlorinated hydrocarbons	CW 41/4

2. Selection of Thermostat/Cone Combination

2.1 Simplified method

In practice—for existing plants—the thermostat/cone combination can, as a rule, be selected against the desired cooling-water outlet temperature.

Desired cooling-water outlet temperature	Thermostat/cone combination
20 to 60 °C (68 to 140 °F)	wr
50 to 100 °C (122 to 212 °F)	nr
-32 to +30 °C (-25 to +86 °F)	kr

2.2 Calculation method

With this calculation the thermostat/cone combination is determined in accordance with full operational data.

Calculation method

a) Actual cooling-water outlet temperature in summer?

$$t_o = \dots \text{ °C}$$

Cooling-water inlet temperature in summer?

$$t_i = \dots \text{ °C}$$

Maximum admissible cooling-water outlet temperature?

$$t_{cw} = \dots \text{ °C}$$

Hence:

Actual temperature difference $\Delta t_1 = t_o - t_i = \dots \text{ K}$
Desired temperature difference $\Delta t_2 = t_{cw} - t_i = \dots \text{ K}$

b) Service pressure in the cooling-water feed line?

$$p_1 = \dots \text{ barg}$$

Back pressure in the cooling-water return line?

$$p_2 = \dots \text{ bar}$$

Level difference between the measuring points for service pressure and back pressure?

$$\text{Height of fall } h_1 = \dots \text{ m} \cong p_{h1} = \dots \text{ bar}$$

or

$$\text{Height of lift } h_2 = \dots \text{ m} \cong p_{h2} = \dots \text{ bar}$$

Calculate the differential pressure as follows:

$\Delta p = p_1 + p_{h1} - p_2 = \dots \text{ bar}$ or $\Delta p = p_1 - p_{h2} - p_2 = \dots \text{ bar}$
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c) Actual uncontrolled cooling-water flowrate of plant?

$$\dot{V} = \dots \text{ m}^3/\text{h}$$

or

maximum amount of heat to be evacuated?

$$Q = \dots \text{ kJ/h}$$

Calculation of k_v value:

$$k_v = \frac{\dot{V}}{\sqrt{\Delta p \left[\left(\frac{\Delta t_2}{\Delta t_1} \right)^2 - 1 \right]}} = \dots \text{ m}^3/\text{h}$$

or

$$k_v = \frac{Q}{4.2 \cdot 10^3 \sqrt{\Delta p (\Delta t_2^2 - 9)}} = \dots \text{ m}^3/\text{h}$$

d) With the aid of Δt_2 , k_v , t_{cw} and the nominal size (DN) the code letters for the thermostat/cone combination can be found in the charts on page 3.

3. Nominal Size (DN)

The size of the cooling-water valve should, where possible, correspond to that of the adjacent pipework. When applying the simplified selection method for the valve/cone combination, usually the pipe size can also be taken as valve size.

4. Connections

Technical Data

Thermostats	w	n	k
Adjustable outlet temperatures	[°C] 20–60 [°F] 68–140	3–100 37–212	-32.. +74 -25..+165
Temporary max. admissible temperature	[°C] 100 [°F] 212	120 248	85 185
Necessary Δt for full valve lift	[degree K] 9	21	21
Hysteresis	[degree K] 1	3	3
Time constant	[s] 30	60	60

w = wax thermostat Number of thermostats in valve: DN 25 mm (1"): 1 off
n = standard thermostat DN 40, 50 mm (1 1/2, 2"): 2 off
k = thermostat for brine DN 80, 100 mm (3, 4"): 3 off

Valve cone

DN	[mm]	25	40, 50	80, 100			
	[in]	1	1 1/2, 2	3, 4			
Valve cone		r	s	r	s		
k_{vs} Value	[m³/h]	2.1	10.5	6.5	31	20	98
k_{v0} Value (bleed flow)	[m³/h]	0.12	0.55	0.31	1.5	1.0	5.0

$$C_v (\text{U.S.}) = 1.17 \cdot k_{vs}$$

$$C_v (\text{U.K.}) = 0.98 \cdot k_{vs}$$

r: reduced cone for small flowrates

s: standard cone for large flowrates

Charts for the determination of the code letters for the thermostat/cone combination

Example 1

The code letters for a cooling-water control valve CW 41 are required, operating data as follows:

- $\Delta t_2 = 14 \text{ K}$
- $k_v = 15 \text{ m}^3/\text{h}$
- $t_{cw} = 40 \text{ }^\circ\text{C}$
- Nominal size DN 50 mm

Solution

The point of intersection between $\Delta t_2 = 14$ and $k_v = 15$ in the chart for DN 50 mm falls into the common range for the code letters ws, ns, ks.

According to the temperature:

ws for t_{cw}	= 20 to 60 °C
ns for t_{cw}	= 50 to 100 °C
ks for t_{cw}	= -32 to +30 °C

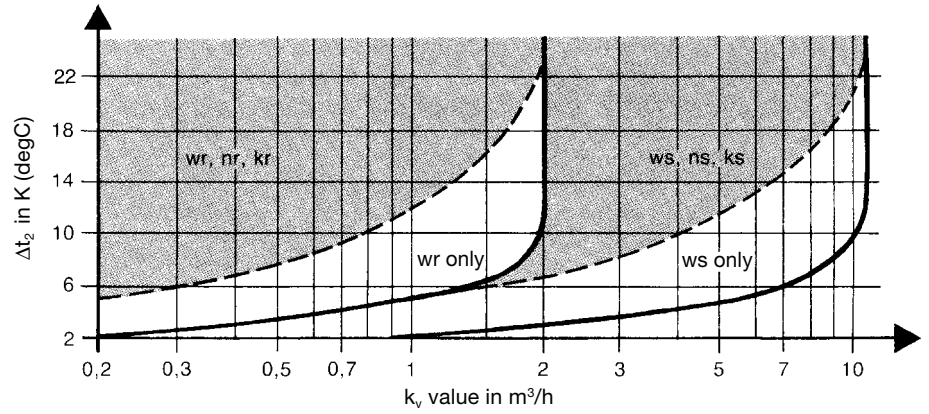
As $t_{cw} = 40 \text{ }^\circ\text{C}$, choose code letter **ws** in this case.

Example 2

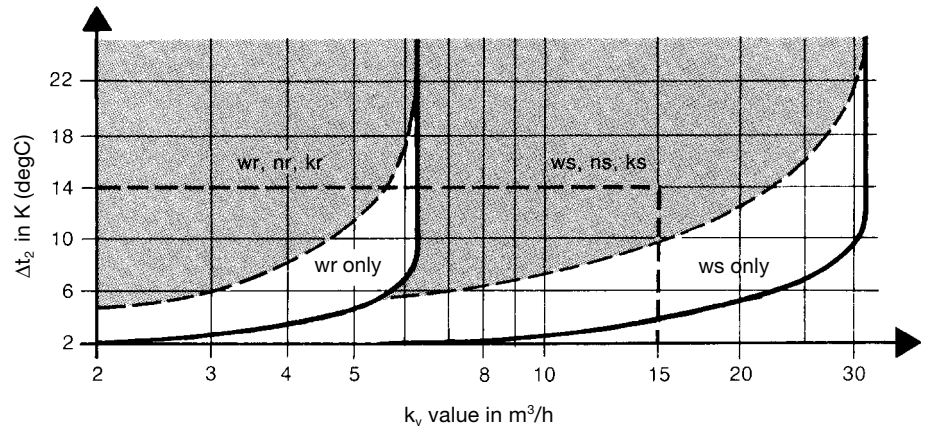
If the point of intersection between Δt_2 and k_v falls into range wr, nr, kr, choose:

wr for t_{cw}	= 20 to 60 °C
nr for t_{cw}	= 50 to 100 °C
kr for t_{cw}	= -32 to +30 °C

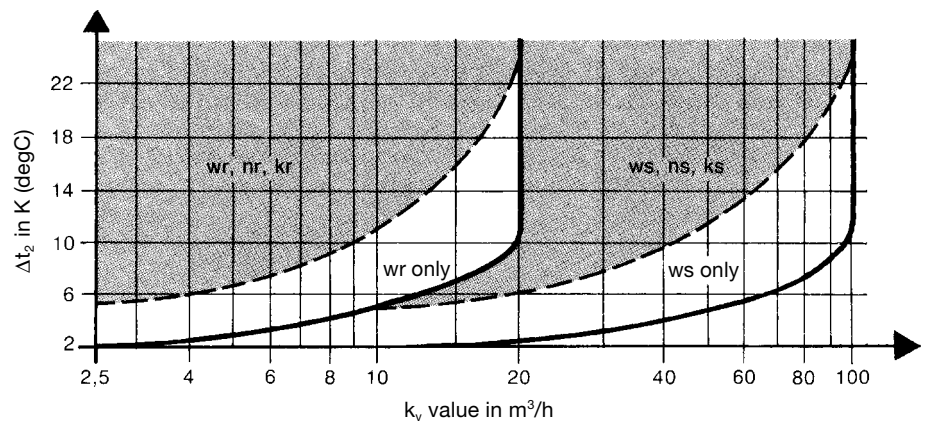
DN 25 mm (1")



DN 40, 50 mm (1 1/2, 2")



DN 80, 100 (3, 4")



Note concerning valve cone selection:

If the nominal size of the valve has not yet been determined (see also point 3) the point of intersection $\Delta t_2/k_v$ can usually be found in several charts.

In this case choose the valve cone with the slightest bleed flow (see k_{vo} value under "Valve Cone", page 2).

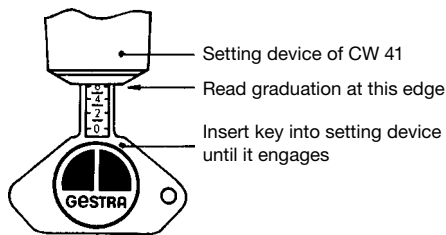
Temperature Adjustment

GESTRA cooling-water control valves CW 41... – exact designation see name plate – can be preset with the adjusting key to the desired cooling-water outlet temperature. The graduations on the key correspond to the temperatures indicated in the adjustment table.

The required outlet temperature is adjusted after start-up. Turn adjusting key $\frac{1}{4}$ to $\frac{1}{2}$ turn at a time. (Remember that one key can be used for all CWs).

The outlet temperature is indicated by the thermometer.

Note that the reaction period of the plant to an adjusted temperature might be 10 to 50 minutes.



Enquiry Specification

GESTRA cooling-water control valve Gestramat CW 41 or CW 41/4. With solid-state thermostat(s), double-seat valve cone, pressure gauge, and thermometer.

Order Specifications

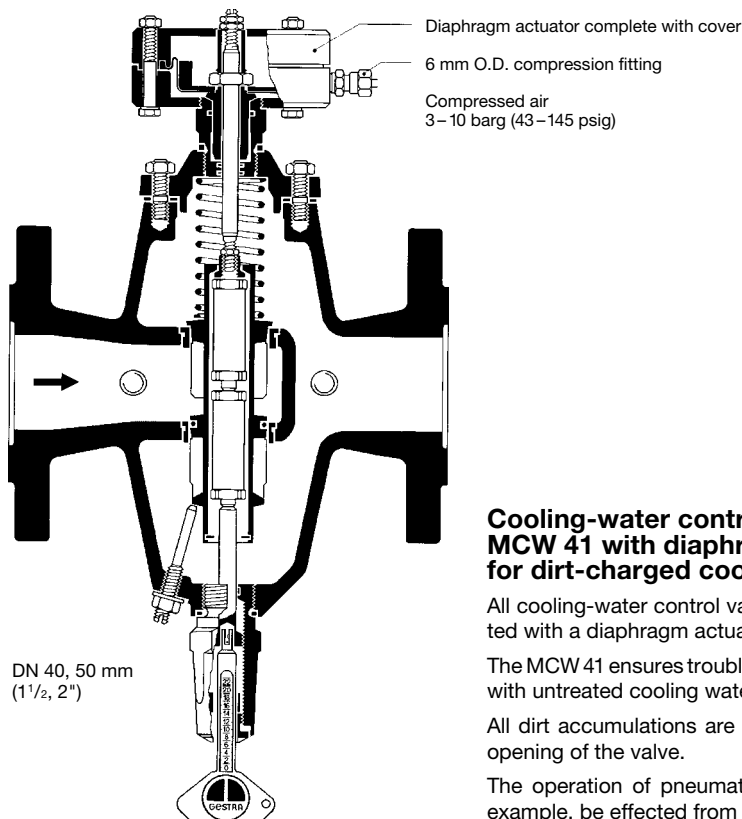
Valve type, thermostat/cone combination, nominal size (DN), connections.

Type of cooling agent, inlet pressure, back pressure, uncontrolled coolant flowrate or heat amount to be discharged.

Supply in accordance with our general terms of business.

Adjustment table for CW 41 wr, ws, nr, ns, kr, ks

Desired outlet temperature in °C									Corresponding graduations on adjusting key
DN 25 mm 1"			DN 40, 50 mm 1½, 2"			DN 80, 100 mm 3, 4"			
wr ws	nr ns	kr ks	wr ws	nr ns	kr ks	wr ws	nr ns	kr ks	
						63	109	74	—
						57	104	69	— 22 —
						54	100	65	—
						51	95	60	— 20 —
						49	90	55	—
			68	114	79	47	86	51	— 18 —
			60	107	72	45	81	48	—
			54	100	65	43	77	42	— 16 —
			50	93	58	41	72	37	—
			47	86	51	39	67	32	— 14 —
			44	79	44	37	63	27	—
68	114	79	41	72	37	36	58	23	— 12 —
54	100	65	38	65	30	34	53	18	—
47	82	51	36	58	23	33	49	14	— 10 —
41	72	37	33	51	16	31	44	9	—
36	58	23	31	44	9	30	39	4	— 8 —
31	44	9	28	37	2	27	35	0	—
25	30	- 5	25	30	- 5	25	30	- 5	— 6 —
18	16	-19	20	23	-12	20	25	-10	—
	3	-32		16	-19		21	-14	— 4 —
				9	-26		16	-19	—
				3	-32		11	-24	— 2 —
							7	-28	—
							3	-32	— 0 —



Cooling-water control valve MCW 41 with diaphragm actuator for dirt-charged cooling systems

All cooling-water control valves can be retrofitted with a diaphragm actuator (MCW 41).

The MCW 41 ensures trouble-free operation also with untreated cooling water, e.g. river water.

All dirt accumulations are purged by actuated opening of the valve.

The operation of pneumatic actuator can, for example, be effected from a control room.

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