NTCL LOW TEMP. THERMOSTAT FOR MOTORSPORT produced by NTCL

▸ About NTCL / Nippon Thermostat Co., Ltd.

Since its founding in 1954, NTCL has produced a large number of automotive thermal devices for use in oil, air, and other systems, including the thermostats used to control engine coolant temperature. Boasting Japan's top thermostat market share, NTCL has been evaluated highly for both its product performance and reliability. Its products have proven their high potential in races and rallies, and they have been recognized the world over.

▸ The history of NTCL and motorsport (summary)

1986 : Together with Japanese automakers, NTCL begins development of racing thermostats for use in Le Mans
1990 : A vehicle with a specially designed NTCL thermostat wins pole position at Le Mans and finishes the race in fifth place
1991 : NTCL supplies the thermostat for the first vehicle from a Japanese automaker to win at Le Mans
1997 : NTCL supplies thermostats for Japanese automakers' vehicles participating in the Granada-Dakar Rally (WRL)
Later, NTCL thermostats are used in the World Rally Championship (WRC) as well.
1998 : A vehicle with a specially designed NTCL thermostat wins pole position at Le Mans and finishes the race in third place
⋮
2007 : A vehicle sponsored by the School of Engineering of Tokai University, with a specially designed NTCL thermostat, takes part in Le Mans for research purposes

Each of these development projects has employed NTCL's proprietary devices for controlling water temperature.

POINT 1 Don't forget the thermostat

Do you tend to think that a large-capacity radiator and name-brand coolant are enough to ensure cooling performance? Actually, tuning the thermostat positioned between the engine and the radiator is the true secret to cooling performance. Thermostat tuning refers to replacing a standard thermostat with Low Temp. Thermostat that starts operating (i.e., opens the valve) at a lower temperature.

POINT 2 The thermostat in cooling-system

A thermostat is a valve that detects engine coolant temperature and controls coolant flow accordingly. In other words, it is a component that controls coolant temperature to keep it at its optimal state.
For example, when coolant heated from running at full throttle flows into a thermostat, the thermostat reacts by opening on its own to begin the flow of cool coolant from the radiator. This temperature at which the thermostat reacts is referred to as the valve opening temperature. Even when switching to a large-capacity radiator, if this valve opening temperature is not lowered, the coolant temperature at which the thermostat starts running will remain unchanged, making the switch to the large-capacity radiator ineffective. In other words, since switching to Low Temp. Thermostat results in the thermostat beginning to operate at a lower coolant temperature, engine coolant temperature is reduced, resulting in sufficient cooling performance.
★A thermostat does not require any electric power. It detects coolant temperature and opens or closes on its own.

POINT 3 The need for a thermostat

Although sometimes people remove the thermostat to give priority to cooling, this definitely is not a good idea.
A thermostat also works to prevent overcooling. Since overcooling can result in insufficient metallic expansion between cylinder and valves, it can cause clearances to grow too high, leading to pressure loss and engine damage and possibly even blowing out the engine. In addition, removing a thermostat with a bypass valve* will make it impossible for components cooled by blocking the bypass (with high-temperature coolant flowing through it) to do so, causing the amount of coolant flowing through the radiator to decrease and leading to overheating, as cooling cannot keep up with heating.
*A valve that blocks a bypass when lifted

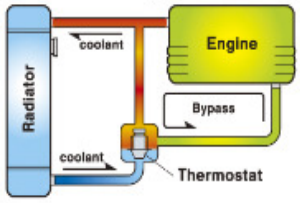
POINT 4 Thermostat mechanism

The structure of a thermostat is shown in Fig. 3. The element both detects the temperature and drives the thermostat. Paraffin wax is enclosed within the element, and the force of this wax's expansion is used to open the main valve. For reference, Fig. 4 shows a fully opened valve.

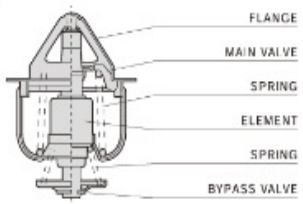
The amount of valve opening — in other words, the relationship between coolant temperature and coolant flow — is determined by the combination of the force of wax expansion and the specifications of the spring used to return the valve in place.

● Fig.1 NTCL LOW TEMP. THERMOSTAT

● Fig.2 The thermostat in cooling-system



● Fig.3 Thermostat mechanism



● Fig.4 Fully opened thermostat

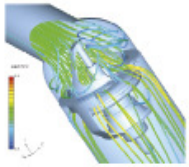
POINT 5 Why use Low Temp. Thermostat?

As its name implies, the valve opening temperature is the temperature at which a valve opens. In other words, overall engine temperature can be reduced by lowering the valve opening temperature, since this makes it possible to send cooler coolant to the engine. (See Fig. 5.) In general, the lower the air temperature prior to combustion, the higher the level of engine output (since the density of oxygen inside the combustion chamber increases, resulting in an increase in the volume of oxygen, which is needed for combustion). Also, since this temperature is in a proportional relationship to overall engine temperature, the following relationship forms: (reduced engine coolant temperature ⇔ reduced air temperature prior to combustion) = (reduced thermostat opening temperature ⇔ increased engine output). The effects of using Low Temp. Thermostat should be felt in improved pickup when depressing the accelerator.
However, it is important to note that this relationship forms only within a certain range. Outside that range (i.e., when the engine is too cool), overcooling takes place, resulting in insufficient carburetion and increased friction, which in turn lead to power loss and possible engine damage.

POINT 6 Why use NTCL Low Temp. Thermostat?

NTCL Low Temp. Thermostats are used in a wide range of motorsports, including Le Mans and the WRC, where they have proven their operating performance and durability. This is because they are based on NTCL thermostats, which are used in more than 50% of cars produced in Japan. NTCL Low Temp. Thermostats are a distillation of NTCL's thermostat expertise. Starting with three-dimensional design, development, and analysis, NTCL conducts a variety of tests on its Low Temp. Thermostats, including durability testing using equipment such as testers that repeat cycles of heating and cooling and vibration testers, engine bench testing, mode testing using chassis dynamos, and testing in actual vehicles. As such, NTCL has complete confidence in the quality and reliability of its thermostats.
Even if it is not NTCL Low Temp. Thermostat, your vehicle probably already has an NTCL thermostat on board.

● Fig.7 Three-dimensional design, development, and analysis



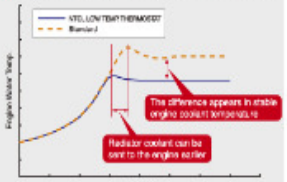
● Fig.8 Engine bench testing

● Fig.9 Chassis dynamo

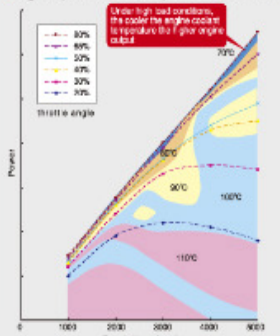
POINT 7 An absolute difference with thermostats from other manufacturers

One absolute difference between NTCL Low Temp. Thermostats and those from other manufacturers is the presence of a function for precise control of flow when the valve is open. Since with an ordinary thermostat a great volume of coolant flows through when the valve is opened, hunting*1 (dramatic changes in water temperature) can result. However, NTCL Low Temp. Thermostat can control flow precisely when opening the valve (to ensure that coolant flows through a little bit at a time instead of in one great gush), making it possible to restrain hunting. (See Fig. 11.) This function, patented in Japan, the United States, and Europe*2, is added to the main valve.
*1 In the worst case, hunting can cause cylinder-head cracking.
*2 JP PAT.2932348 US. PAT.5548244 EP PAT.0716367

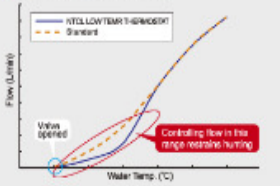
● Fig.5 Comparison of engine coolant temperature



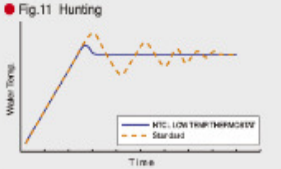
● Fig.6 Optimal coolant temperature distribution



● Fig.10 Flow characteristics



● Fig.11 Hunting



Essence of cool driving

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