TR 60-01 Guidelines Layout of intercooler Technical Circular 60-01

Guidelines for the layout of intercooler

Affected engines:

☒ MAG 33.3 T 11XA	☒ MAG 33.3 T 13XA
☒ MAG 49.4 T 11XA	☒ MAG 49.4 T 13XA
☒ MAG 74.6 T 11XA	☒ MAG 74.6 T 13XA
☒ MAG 84.6 T 11XA	☒ MAG 84.6 T 13XA
	☒ MAG 13.6 T 13XA

☒ customer-specific special motors

1. General

A charge air cooler (or receiver) is a heat exchanger that reduces the temperature of the gas-air mixture supplied to the engine in the intake tract of a supercharged gas combustion engine. It is installed in the intake tract between the compressor (compressor wheel of a turbocharger or compressor) and the intake valve and dissipates part of the heat generated by the compression of the air in the turbocharger.

2. Types of intercoolers

The cooling of the hot gas-air mixture can be done in different ways. Two principles have been established, with different types of charge air path design depending on the system selected:

- Direct charge air cooling: air-air
- Indirect charge air cooling: air-water

Air-water coolers have established themselves in stationary systems in CHP applications. Therefore, this technical circular letter only deals with this principle.

Shell-and-tube heat exchangers

Each of these consists of a steel cylinder inside which many pipes run. It is thus divided into two parts: a jacket side and a pipe side. The gaseous medium is often passed through the bundles, the jacket side absorbs the water to be heated.

The tube bundles can be straight, U-shaped or - as is the case in some BS Nova heat exchangers - spirally wound tubes. This increases the surface area and the gaseous medium has more time to release its energy to the water.

Plate heat exchanger

These consist of several plates, through the spaces between which the two media are alternately passed. The individual plates also often have a profile that creates turbulence, extends the path of the medium and thus transfers heat even better. Plate heat exchangers transfer heat very well and quickly but require more maintenance.

Both systems have their advantages in different applications.

3. Project planning guidelines

Only by strictly observing and implementing these project planning guidelines, the MAMotec gas engine will achieve the guaranteed line, efficiency, exhaust gas limits and durability. In case of non-compliance any warranty of the gas engine manufacturer will expire.

Parameters	**Guidelines**
Material selection heat exchanger	Basically only stainless steel heat exchangers are approved!
Assembly intercooler	The heat exchanger must be installed in such a way that the shortest possible line length between the exhaust gas turbocharger, intercooler and engine intake manifold is achieved. The intercooler must be mounted on the engine. Here, attention must be paid to effective vibration decoupling.
Piping of ATL-LLK	This is to be carried out vibration-decoupled by means of a compensator. The decoupling must be designed for permanent temperatures **of 250°C at 2bar overpressure**.
Piping LLK suction bridge engine	This must be dimensioned in such a way that the cross-section is oriented to the opening cross-section of the intake pipe.
Throttle valve	This must be configured on the pressure side between the intercooler and the intake manifold. **Under no circumstances may the throttle valve be installed on the intake side in front of the turbocharger! This can lead to damage to the turbocharger!**
Design of charge air cooler gas side	The outlet temperature after the intercooler may **not be below 40°C**. Condensate formation must be avoided at all operating points.
Cooling water Charge air cooler	The water quality to be used can be found in the documentation of the heat exchanger manufacturer. The inlet temperature of the heat exchanger must be controlled to ensure a constant gas mixture outlet temperature from the heat exchanger. The gas temperature may only fluctuate by 1k/min at the operating point.
Safety devices	A safety monitoring system must be provided between the gas engine and the charge air cooler, which reliably identifies possible backfiring and burns in the intake tract of the gas engine and immediately switches off the system. This monitoring must be integrated into the safety chain of the entire system!

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