



Compressor Internal Pressure Relief Valve (IPRV)

When a compressor is found to be running, but is not pumping refrigerant, does that mean it has failed? Should the compressor be replaced? Not always!

When an air conditioning or refrigeration system malfunctions, it is possible for the compressor to experience extremely high head pressures. This can occur when a condenser fan fails, a condenser coil is blocked (resulting in restricted airflow), or an excessive amount of refrigerant has been charged into the system. While a compressor is designed to handle pressures that are outside its normal operating envelope, the combination of extreme pressures and the excessive temperatures that can result may be sufficient to cause mechanical failure.

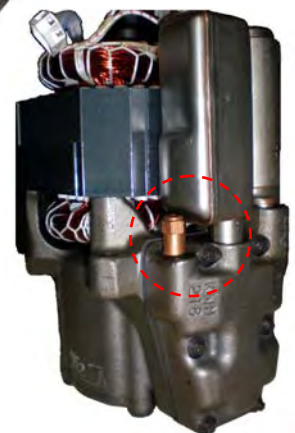
Such failures can be prevented by the installation of a high pressure control, which will interrupt electrical supply to the compressor when a preset head pressure is exceeded. Many air conditioning and refrigeration systems, however, do not have this type of protection against excessive head pressures.

To provide compressor protection in such circumstances, each Kulthorn AW and KA compressor is fitted with an Internal Pressure Relief Valve (IPRV). This is a valve within the compressor that, when open, allows refrigerant gas to pass within the compressor from the high pressure region of the cylinder head to the housing, or the low pressure side of the compressor. It effectively bypasses the refrigeration system.

The IPRV is designed to open when the pressure difference between the high side (head pressure) and the low side (suction pressure) reaches approximately 550 psi. As an example, if the suction pressure is 75 psig, the head pressure will need to increase to about 625 psig in order for the IPRV to open.

The design of the IPRV is such that, while it opens at a nominal pressure difference of 550 psi, it will not reset, or close, until the pressure difference drops to approximately 100 psi.

An IPRV will only be effective for compressors applied on “high pressure refrigerants”, such as R22, R404A, R407C, etc. The IPRV is unlikely to open on a malfunctioning R134a system.



IPRV assembly with compressor cylinder head



KULTHORN COMPRESSOR

What happens in the field?

When a compressor IPRV opens due to an abnormal pressure difference, the compressor will continue to run but no longer pumps refrigerant around the system in the normal way. Most of the refrigerant simply circulates within the compressor. The restriction of the IPRV maintains a pressure difference that is sufficient to prevent the IPRV from closing as long as the compressor continues to run.

The compressor temperature increases as a result of refrigerant circulating within the compressor. When the compressor temperature is sufficiently high, the motor protector opens, and the compressor stops. At this point the pressures balance within the compressor, and the IPRV closes. It should be noted that it may take some time before the motor protector operates and the compressor is stopped. When the compressor cools sufficiently, the motor protector will reset, the compressor will start, and will run until the IPRV again opens. The cycle will continue until the problem is corrected.

The opportunity for an incorrect diagnosis occurs when a technician is called, and he arrives after the IPRV opens and before the motor protector trips. He sees the compressor running but not performing. The technician may reach the conclusion that the compressor has failed, and will then replace it without further analysis.

If a Kulthorn AW or KA compressor is observed to be running but not pumping, the compressor should be switched off and the pressures allowed to balance. The compressor should then be restarted, and its performance checked. If the head pressure immediately rises to an excessive level, then clearly the compressor is capable of pumping, and there is a system malfunction that should immediately be investigated.