KRAMER TECHNICAL BULLETIN

HOLDBACK VALVE

APPLICATION - FUNCTION - ADJUSTMENT - REPLACEMENT

The Thermobank hot gas defrost system is unique in the commercial refrigeration industry in that it utilizes a positive heat source (the Thermobank) to re-evaporate or boil off the liquid refrigerant which is condensed inside the evaporator during the defrost cycle. In order to control the rate of evaporation or boiling point of the liquid refrigerant inside the bank, the holdback valve functions as a metering device, creating a pressure drop across the valve port which causes the condensed, high pressure liquid returning via the suction line to boil inside the bank. As the liquid refrigerant boils, it absorbs both the sensible and latent heat contained within the water inside the bank, turning the refrigerant back into a superheated gas which can be safely returned to the compressor suction intake.

Although technically by design the holdback valve is a crankcase pressure regulator, it should never be adjusted based on the maximum running load amps of the compressor but rather based on the evaporating temperature of the refrigerant inside the Thermobank during the defrost cycle. The fundamental secret to the operating efficiency and success of any hot gas defrost system is not the temperature of the hot gas supplied to the evaporator inlet but its pressure and flow. Insufficient flow of hot gas will result in excessive defrost cycle times and poor overall performance of the defrost system. Therefore proper adjustment of the holdback valve during the defrost cycle is absolutely critical in order to;

- **Maximize the compressor mass flow**
- **Minimize the length of the defrost cycle**
- **Maximize compressor protection against liquid refrigerant flood back**
- **Minimize compressor discharge temperatures**
- **Maximize system oil return**

IF THE HOLDBACK VALVE IS NOT PROPERLY ADJUSTED THE COMPRESSOR WILL OVERLOAD AND MECHANICAL DAMAGE MAY RESULT!

The holdback valve is not preset at the factory and therefore must always be properly adjusted and set at initial system start-up or anytime the valve is replaced. (see HOLDBACK VALVE ADJUSTMENT PROCEDURE below). The valve setting should also be checked during routine, regularly scheduled system maintenance and anytime system service is performed, by a qualified refrigeration technician.

In order to properly check / adjust the valve setting, a suction service gauge should first be connected to the low pressure service port at the compressor suction service valve and a high pressure service gauge should be attached to one of the available schrader valve fittings on the small, copper control manifold located on the back of the electrical control box inside the compressor compartment. Once these (2) gauges are properly attached, the defrost cycle may be initiated by manually advancing the defrost time clock into a defrost cycle (turn the timer dial clockwise until it engages a defrost tripper pin).

At the beginning of the defrost cycle, the suction pressure at the compressor service valve gauge will drop as the compressor is temporarily starved of its return suction gas flow by the diversion of hot gas to the evaporator inlet. As the defrost cycle progresses, the quantity of liquid refrigerant returning from the evaporator via the suction line will increase, as will it's pressure as observed on the high side gauge. This will result in a corresponding increase in the suction pressure observed at the compressor suction service valve. Within 2-3 minutes, the maximum setting of the holdback valve should be achieved

Note: Due to the varying liquid quality / quantity and increasing pressure of the refrigerant feeding the inlet of the holdback valve, some fluctuation or "hunting" of the valve outlet pressure should always be expected.

At this point, the valve should be adjusted to maintain 15 to 20 PSIG maximum at the compressor suction service valve inlet. When adjusting the valve, proceed slowly and allow the suction pressure to stabilize between valve adjustments. Depending upon the valve application, a slight change in the valve adjustment stem may result in a large change in the valve outlet pressure so adjust the valve only (1) or (2) turns at a time.

This initial setting should be satisfactory for all Thermobank III systems operating on either medium or low temperature systems and utilizing the following refrigerants; R404A / R507 / R22 / R408A / R407C

Note: On Sporlan CRO type valves only, if any refrigerant pressure and/or oil can be heard or observed leaking from the valve body when the adjustment cap is initially removed then the valve has failed internally and must be replaced as it will not regulate once the adjustment cap is replaced!

If refrigerant floodback through the Thermobank and to the compressor suction is observed during the defrost cycle (assuming the Thermobank is full of water and the system has operated continuously in the refrigeration cycle for a minimum of (2) hours prior to initiation of the defrost cycle) then the holdback valve setting should be reduced. If the outlet of the Thermobank remains hot throughout the defrost cycle, the compressor cycles off on the discharge temperature safety thermostat (Carlyle compressors only), or the length of the defrost cycle is excessive, then the holdback valve setting should be increased. If the defrost cycle is to long (typically in excess of 10 minutes on any Thermobank III system) then the holdback valve setting should be increased.

For many years, Kramer utilized a Sporlan model CRO-10 crankcase pressure regulator which was specially modified to withstand the rigors of our unique application of this valve. This specially modified valve, available only through Kramer or its authorized distributors, can be identified from the standard Sporlan valve not only by its short, stubby connections but by a special X59 prefix ahead of the standard CRO-10 part number stamped on the valve cap. More recently, our engineering department has qualified an alternate holdback valve which is now being used not only on new production units but is also available as a service replacement to replace existing X59CRO-10 valves. This valve is a Parker (Refrigerating Specialties Division) A8 series, compact outlet regulator. The standard 5/8" port valve can be used in place of any single X59-CRO-10 Sporlan valve and is also available in larger port configurations to replace multiple Sporlan valves on parallel Thermobank applications (see HOLDBACK VALVE APPLICATION chart below). The valve function (as an outlet regulator) is identical to that of the original Sporlan valve although the valve is physically different in appearance and adjustment. The only special consideration required when replacing the original Sporlan valve with the Parker valve is that the A8 valve requires the use of an external equalizer connection. A length of 1/4" copper tubing must be field connected to the 1/4" male flare fitting on the replacement valve body and the other end of this tube must then be physically connected to the suction tubing on the *outlet* of the Thermobank. For clarity, please refer to the typical Thermobank III system piping diagram attached.

HOLDBACK VALVE APPLICATION / PART NUMBER

COND UNIT HP	ORIGINAL VALVE			REPLACEMENT VALVE		
	VALVE QTY	MANUF PART #	KRAMER PART #	VALVE QTY	MANUF PART #	KRAMER PART #
3/4 - 3	1	CRO-6	204470114	1	CRO-6	204470114
4 - 30	1	X59-CRO-10	107146009	1	A81OE (5/8" PORT)	107147039
30M	1	X59-CRO-10	107146009	1	A82OE (1-5/8" PORT)	107147003
44 - 90	2	X59-CRO-10	107146009	1	A82OE (2-1/8" PORT)	107147004

NOTE - THIS VALVE IS USED FOR 30 HP MEDIUM TEMP UNITS ONLY WITH (1) L-60 THERMOBANK

HOLDBACK VALVE ADJUSTMENT PROCEDURE

VALVE TYPE	ADJ NOTE	ADJUSTMENT METHOD	TO INCREASE SUCTION PRESS (RAISE VALVE SET POINT)	TO DECREASE SUCTION PRESS (LOWER VALVE SET POINT)
CRO	1	5/16" HEX WRENCH	TURN ADJ STEM IN (CLOCKWISE)	TURN ADJ STEM OUT (COUNTERCLOCKWISE)
A8	2	ADJ WRENCH	TURN ADJ SCREW IN (CLOCKWISE)	TURN ADJ STEM OUT (COUNTERCLOCKWISE)
NOTE	1	REMOVE CAP ON END OF VALVE TO ACCESS VALVE ADJUSTMENT SCREW		
NOTE	2	LOOSEN SEAL NUT BELOW ADJUSTMENT STEM ON TOP OF VALVE BONNET BEFORE ADJUSTING		

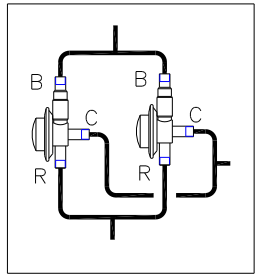
REV	DESCRIPTION	EN NO.	BY	DATE

KRAMER
YUMA, AZ

DRAWN BY	DATE	DRAWING NUMBER
F.Q	04/14/08	A-30207-PRKR

MATERIAL THERMOBANK#3 CONDENSING UNITS

SCHEMATIC PIPING DIAGRAM



2-FLOOD VALVE WHEN REQUIRED

N.O. CONDENSER SOL. CLOSES ON DEFROST

CONDENSER

REFRIGERANT CHARGE MONITOR (PATENT NO. 3,753,358)

* PATENT NUMBERS
4,083,195
4,102,151

FLOOD VALVE

CHECK VALVE

SUB-COOL CIRC.

FILTER DRIER

SIGHT GLASS

REC. INLET VALVE

RELIEF VALVE

REC. OUT VALVE

RECEIVER (OVERSIZED)

HAND VALVE

LOW AMB. MODULE

N.C. BYPASS SOLENOID OPENS ON DEFROST

TXV

N.C. LIQUID SOLENOID

CHECK VALVE

EVAPORATOR

N.C. HOT GAS SOLENOID OPENS ON DEFROST

HEAT TRACE DRAIN LINE

BOX T'STAT

THERMOLATOR (OPTIONAL)

HEATING COIL

RE-EVAP. COIL

THERMOBANK

NOTE:
FACTORY MADE
BY INSTALLER

VIB.

DISCH. SOL. PRESS. CONT. SET TO 300# CUT/OUT 225# CUT/IN P170CA-3

OIL SEP OPTIONAL

OIL SEP.

USE BAFFLE PLATE WHEN USING CARLYLE COMPRESSOR

LOW PRESS. CONTROL

OIL RETURN SOLENOID

HOLDBACK VALVE A8A10E

HOLDBACK CHECK VALVE "L" SYSTEM ONLY 4 PSI

SUCTION SOLENOID VALVE

DISCH. VALVE

SUCT. VALVE

VIB.

COMPRESSOR

SUCTION ACCUMULATOR (OPTIONAL)

SUCTION FILTER

DRAWING NUMBER
A-30207-PRKR