

# Operating Manual

**Model: 66TSV**

**Size: "**

**Serial #:**

**Sales Order :**

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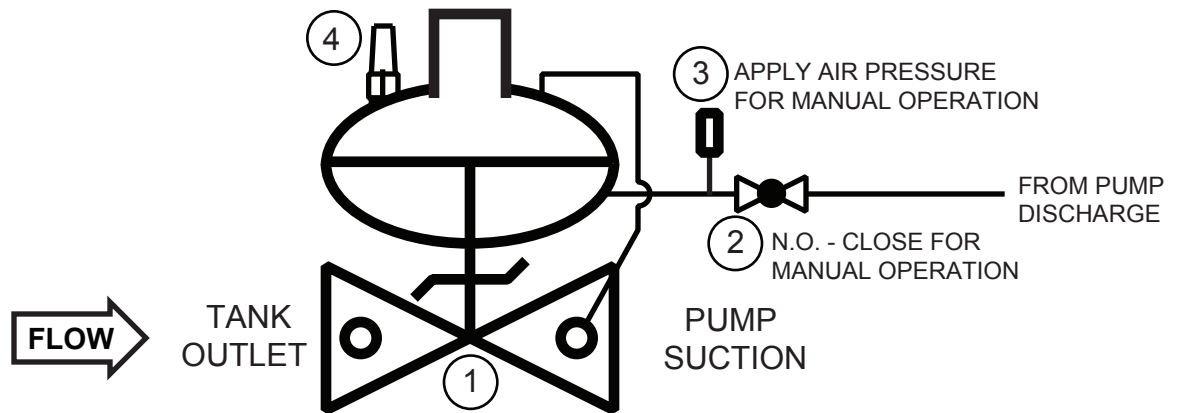


**Global** performance. **Personal** touch.

## MODEL 66TS

### TANK SAFETY VALVE

Rev A  
11-5-2018  
JRK



#### OPERATION:

66TS opens when pump discharge pressure overcomes 66TS internal spring forces, usually around 6-10 psi.

Manually Override is required to prime system upon startup. Close ball valve (2) and apply pressure to schrader valve (3) to force 66TS full open. Once system is primed, re-open ball valve (2) for normal service operation.

ITEM	PART NO.	QTY	DESCRIPTION
1	66TS	1	BASIC TANK SAFETY VALVE ASSEMBLY
2	141-4	1	BALL VALVE
3	684700	1	SHRADER VALVE
4	155	1	VISUAL INDICATOR

# installation, operating, and maintenance instructions

## tank safety valve

### model 66TS

#### GENERAL DESCRIPTION

In most refinery applications, product storage tanks are located at a remote distance from the loading facilities. This practice is, of course, very wise from a safety standpoint. In order to maximize the safety of such a system, the tank should also be isolated from the loading facilities at all times that a loading operation is not taking place. In this way the tank can be protected in case of a fire or in case of rupture of the delivery piping.

Such an arrangement requires a valve. The simplest approach would be to provide a manual on-off valve at the tank. However, this would require a second person, in addition to the loading man, to insure that the valve was open at the start of the loading operation and closed when loading was completed. This system would be inconvenient and, if mistakes were made, extremely costly. Forgetting to open the valve to start loading could result in damage to the delivery pump. Forgetting to close the valve after loading would compromise the safety of the entire system.

A far better approach is an automatic valve located at the tank. This valve would open quickly and fully when the delivery pump was started and close immediately and tightly on pump shutdown. It would remain closed at all times the pump was not running. For the utmost in safety and reliability it should be completely hydraulic in operation—i.e., no electrical power required, yet it should be completely operable even when it is at a remote distance from the delivery pump.

The OCV Model 66TS Tank Safety Valve is specifically designed to meet all of the requirements outlined above. Physically, the 66TS is a single-seated, hydraulically-operated, diaphragm-actuated globe valve designed to operate from the pressure differential created by the delivery pump. It is a power-actuated type valve with isolated upper and lower diaphragm chambers. Thus the actuating pressure differential is completely independent of the flow loss through the valve, enabling the total pressure drop in the pump suction line to be kept to a minimum.

The 66TS will start to open when the pump differential reaches 5 psi. Specially designed valve internals allow sufficient flow to the pump after only a small degree of opening. The valve will be fully open when the pump differential reaches 15 psi. With a properly sized sense line and a minimum of 30 psid available from the pump, the total opening cycle will take no more than 10 seconds. On pump shutdown, the valve will immediately start closed. With a properly-sized sense line the closing cycle will take no more than 15 seconds.

Once closed, the 66TS will remain closed until the pump is once again started. The valve is fail-safe—i.e., if its diaphragm should fail, the valve will close whether or not the pump is running. The valve also contains a built-in thermal relief feature: if the downstream pressure should building to approximately 6-10 psi above tank head, the valve will open slightly to relieve excess pressure back to the tank.

## MANUAL OPENING (OPTIONAL)

The 66TS can be fitted with a manual opening feature which enables the valve to be pumped open with a hand pump to gravity-feed the system in case of delivery pump malfunction.

## INSTALLATION

Proper installation of the 66TS is essential to its correct operation in the system. The recommended installation is shown schematically on drawing 66TS-XXX.

The tank safety valve itself should be installed as close as possible to the tank in order to maximize its objective of tank isolation.

The manual isolation valves shown are not essential to system operation but are extremely desirable should internal maintenance have to be performed on the tank safety valve.

The pump must be capable of developing a pressure differential of at least 15 psi above tank head at full flow in order to fully open the tank safety valve.

Proper sizing of the sense line between the pump discharge and tank safety valve is extremely important, especially when the valve and pump are an appreciable distance apart. Undersizing of this line will result in slower opening and closing of the valve. Notice that the recommendations shown are based on a 10-second opening with a 30-psi pump and a 15-second closing. If faster operation is desired, or a weaker pump is employed, the sense line should be increased proportionately.

In many systems, the line downstream of the pump is essentially "open" when the pump is started. Starting the pump under such low head conditions will result in insufficient differential to open the tank safety valve. The combination of low head and no suction supply can bring about immediate and extreme cavitation of the pump. In order to prevent this occurrence, it is highly recommended that a **slow-opening** check valve be installed on the pump discharge. In this way the pump starts against a closed valve, the discharge head is immediately high, the tank safety valve opens readily, and, as the check valve slowly opens, there is a smooth transition from no flow to full flow, with no risk of pump cavitation.

The check valve also serves to prevent backflow of product into the storage tank when the pump is off. Note that the tank safety valve itself provides limited backflow

protection, but only to 6-10 psi back pressure. If the backflow potential is greater than this, the check valve is a necessity.

In short, the slow-opening check valve can safely be omitted only if both the following conditions exist: (1) the discharge piping is "closed" on pump start-up and is full of fluid at all times, and (2) backflow protection above 6-10 psi is not necessary.

Three other features, not shown on the installation diagram, are desirable:

1. The sense line between the valve and pump discharge should be kept clear and free of buildup of particulate matter. To insure this, install a strainer in the sense line at the pump discharge. The strainer should, of course, be of at least the same nominal size as the sense line.
2. If the slow-opening check valve is used, and thermal pressure buildup in the piping downstream of the check valve is a possibility, a thermal relief valve should be installed on the check valve to relieve this pressure back to the pump side. It will then be led back to the tank by the built-in thermal relief feature of the tank safety valve.
3. If the tank safety valve is equipped with the manual feature, a manual on-off valve should be a low-loss type such as a gate or ball valve.

## THEORY OF OPERATION

The 66TS is actuated by a differential pressure acting across its diaphragm. The lower diaphragm chamber receives pressure from the pump discharge. This pressure acts in the direction to open the valve. The upper diaphragm chamber senses pump suction pressure and also contains the valve spring. These forces act in the direction to close the valve.

There is also a net closing force across the valve seat caused by the differential of tank head acting over the seat and pump suction pressure acting under the seat.

**OPENING CYCLE:** When the pump is started, its discharge pressure starts to rise. When this pressure rises to 5 psi over tank head, the closing forces acting on the valve are overcome and the valve starts open. The discharge pressure continues to increase. When it reaches 15 psi over tank head, the valve will be fully open.

**CLOSING PRESSURE:** When the pump is stopped, the discharge and suction pressures become equal to tank

head. There are now no differential pressures acting on the valve, only the closing force created by the spring. Therefore the valve closes readily.

**THERMAL RELIEF:** With the valve closed and the pump off, there are normally no differential forces on the valve except for the spring. However, if there is a thermal pressure buildup in the downstream piping, an opening force will be applied under the valve seat. When this pressure is sufficient to overcome the spring (6-10 psi over tank head), the valve will open a small amount and relieve the excess pressure back to the tank.

## MAINTENANCE

Visual inspection at periodic internals is required to determine the general physical condition of the equipment. This inspection should be conducted at no more than 30 day intervals. The following is a list of "check points" to assist maintenance personnel in this task.

- a. Check for chipped or peeling paint.
- b. Check that all tube fittings on the valve are secure.
- c. Check for damaged tubing.
- d. Check for leaks at fittings and around bonnets and flanges.
- e. Check for loose bolts on bonnets and flanges.

## TROUBLESHOOTING

The 66TS, due to its rather simple construction and positive action, should provide virtually trouble-free operation. If problems should occur, the following outline should enable maintenance personnel to isolate the specific malfunction and take the appropriate remedial action.

### A. VALVE FAILS TO OPEN OR OPENS TOO SLOWLY

1. Sense line too small—See chart on drawing 66TS-XXX.
2. Sense line clogged—Clean strainer if one is installed. If not, clean sense line as required and install strainer in sense line where it joins the pump discharge line.

3. Main valve diaphragm ruptured—replace diaphragm.

**NOTE:** Any time maintenance is required inside the valve, close the manual isolation valves located on either side of the valve. Due to the heavy spring employed in the 66TS, use extreme caution in removing the bonnet. Remove all bonnet nuts except two located at opposite sides of the bonnet. Loosen these two nuts slowly and evenly until the spring tension is relieved. When reassembling the valve, "jack" the bonnet down against the spring with two nuts at 180°, tightened evenly.

4. Valve stem binding—Disassemble valve as noted above and check the stem and upper and lower bearing areas for burrs, deep scratches, or buildup of foreign material. Clean and polish as required.

### B. VALVE FAILS TO CLOSE OR CLOSES TOO SLOWLY

1. Sense line too small—See A1 above.
2. Sense line clogged—See A2 above.
3. Valve stem binding—See A4 above.

## MANUAL OPENING OPTION

The manual opening feature is provided by means of a Schrader valve which is installed at the inlet port of the 66TS intermediate plate. To complete the requirements for this option, a manual on-off valve must be installed in the sense line leading from the pump discharge. For convenience, the valve should be installed near the point where the sense line connects to the body. The on-off valve should be of a low-loss type such as a ball valve or gate valve.

To manually open the 66TS, first close the on-off valve. Connect the pressure source (hand pump, low pressure air bottle, etc.) to the Schrader valve. The 66TS can then be opened fully by applying pressure equal to 15 psi over tank head.

To return the 66TS to the closed position, simply remove the pressure source and open the on-off valve.

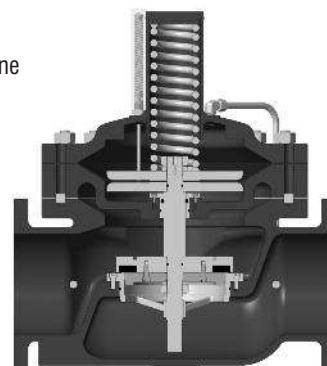


▲ Model 66TS

The Model 66TS Tank Safety Valve is designed to automatically isolate a fuel storage tank from its loading terminal or product transfer point. Hydraulically linked to the delivery pump, the valve is open only when the pump runs and is effectively producing pressure. The valve will automatically close when the pump is off, fails to produce pressure, or in the event of a line rupture.

## SERIES FEATURES

- ▶ Totally hydraulic operation; no electrical connections
- ▶ Dual chamber, full open, low pressure drop design
- ▶ Thermal relief of excess downstream pressure
- ▶ Provides anti-siphon protection
- ▶ Capable of manual operation
- ▶ Can be maintained without removal from the line
- ▶ Valve position indicator standard
- ▶ Factory tested



## OPERATION

The 66TS is built on a dual diaphragm chamber valve design. It is opened and closed by pressure applied to either side of the diaphragm. The lower chamber receives pressure from pump discharge and acts to open the valve while loss of this pressure allows the valve spring to close the valve.

**Opening Cycle**-When the pump discharge pressure reaches 5 psi over tank head, the valve begins to open. It is fully open when pump discharge is 15 psi over tank head.

**Closing Cycle**-Valve closing will start when pump discharge pressure drops for any reason to tank head. This may be due to normal pump shut down, pump failure or line rupture.

**Manual Opening**- The valve is equipped with an Schrader air valve to enable connection of a pressure source (hand pump, low pressure air bottle, etc.) to open the valve.

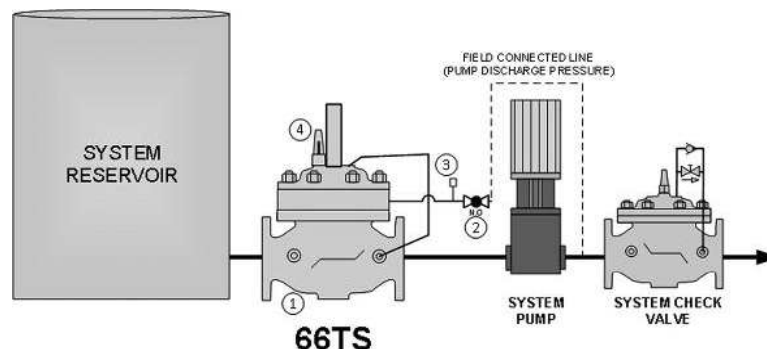
**Thermal Relief**- Pressure buildup of 6-10 psi (above tank head) in the downstream piping will automatically be relieved back through the valve to the tank.

## COMPONENTS

- 1.) 66TS Main Valve
- 2.) Ball Valve
- 3.) Schrader Valve
- 4.) Visual Indicator

## CROSS-SECTION DRAWING

## RECOMMENDED INSTALLATION



- ▶ Install the proper size sense line from the pump discharge to the valve connection. Based on a valve-to-pump distance of 600 ft., the following schedule 40 pipe sizes are recommended

VALVE SIZE:	2"-3"	4"-6"	8"	10"	12"
SENSE LINE SIZE:	3/8"	3/4"	1"	1 1/4"	1 1/2"

- ▶ Sense line connection at 66TS should have a ball type or positive shut off type valve installed (to facilitate manual opening).
- ▶ To prevent pump cavitation on start-up, pump discharge check valve should be of the slow-opening type to ensure adequate pressure for initial opening of the tank safety valve.
- ▶ Install the valve with adequate space above and around the valve to facilitate servicing. Refer to the Dimension Table.

## SIZING

The size of the Model 66TS is typically the same as the pump suction line; however, the velocity through the valve should never exceed 20 ft/second as shown below. Valve pressure drop may be calculated using the Cv values shown. Consult the factory for assistance.

SIZE	2"	3"	4"	6"	8"	10"	12"	16"
MAX. FLOW, GPM	200	460	800	1800	3100	4900	7000	11000
Valve Cv	47	120	200	450	750	1250	1960	2850

## MAX. PRESSURE

(The pressures listed here are maximum pressures at 100°F)

END CONNECTIONS	DUCTILE IRON	STEEL/STN STL
Threaded	640 psi	640 psi
Grooved	300 psi	300 psi
150# Flanged	250 psi	285 psi
300# Flanged	640 psi	740 psi

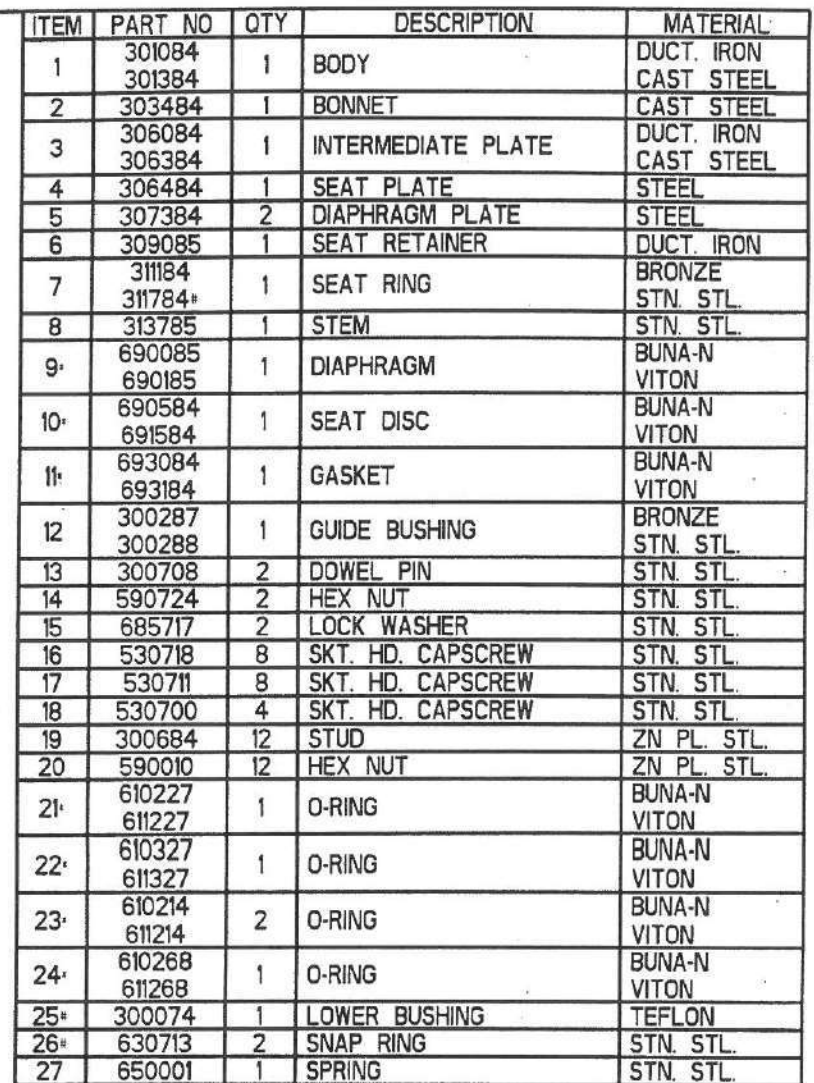
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REVISED 11/02/18

**Model 66TS Tank Safety Valve**





\* : PARTS PROVIDED WITH STAINLESS STEEL SEAT RING

E					MATERIAL	TOLERANCES		OCV Control Valves		
D						UNLESS NOTED		TULSA OKLAHOMA USA		
C						XX ±.015		8" 3200 TANK SAFETY VALVE		
B						XXX ±.005				
A						ANGULAR ±0.5°				
						MACH. FINISH 125				
					NO. REQ'D	DRAWN BY	DATE	SIZE	DRAWING NUMBER	REV
CHG	ECN	DATE	BY			SDJ	03-20-06	A	3250TS	
					SCALE	CHKD BY	DATE			
REVISIONS					REF DWG NO'S	15%				



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