



## Stainless Steel Captive Acceleration Tube

**C.A.T. Models**      **711500**  
    **714500**  
    **717500**

### FEATURES

- Flexible tube absorbs energy from a positive head to increase fluid acceleration which significantly reduces cavitation and resulting potentially damaging system surges or hydraulic spikes.
- Eliminates wear producing shocks to the system components especially when high temperature, booster pump feed, long inlet lines or quick coupling valves exist.
- Prolongs life and reduces operating cost by reducing inlet condition induced cavitation.
- Compact, simple design permits versatile, easy installation and requires minimal maintenance.

**SELECTION:** Select a C.A.T. tube with a flow range to match the system flow and the pump inlet connection. Various adapters are available to accommodate the various pump inlet connections.

**INSTALLATION:** For optimum performance, install the C.A.T. directly into the inlet manifold of the pump and **support it from the base plate**. First, select the correct adapter that matches the pump inlet size. Note: Bent fitting requires a standard adapter to properly connect to pump. Next **apply Liquid Gasket** to the o-ring groove and press the flanged end of the adapter (o-ring and retaining ring come on the adapter) into the C.A.T. until completely seated. Then secure the retaining ring in the groove of the C.A.T. Apply sealant to the adapter threads. With a wrench thread assembly into pump inlet port. **CAUTION:** Do not over tighten. Because the adapter rotates within the C.A.T. end, there is no risk of twisting the internal hose.

### SPECIFICATIONS

	U.S. Measure	Metric Measure
<b>MODEL 711500</b>		
Flow Range .....	up to 15 GPM	(up to 57 L/M)
Active Tube Fitting .....	1-1/2"	(38 mm)
Weight (Base Model) .....	1.3 lbs.	(0.60 kg)
<b>MODEL 714500</b>		
Flow Range .....	up to 45 GPM	(up to 171 L/M)
Active Tube Fitting .....	2-1/2"	(63.5 mm)
Weight (Base Model) .....	4.0 lbs.	(1.80 kg)
<b>MODEL 717500</b>		
Flow Range .....	up to 75 GPM	(up to 284 L/M)
Active Tube Fitting .....	3"	(75 mm)
Weight (Base Model) .....	4.8 lbs.	(2.20 kg)

### COMMON SPECIFICATIONS

Inlet Pressure .....	2 to 50 PSI	(0.1 to 3.5 BAR)
Temperature* .....	208°F	(98°C)

\*Do not exceed rated pump temperature. See individual pump specification sheets for maximum temperature of each model.

**OPERATION:** The C.A.T. tube is designed to maintain consistent inlet pressure to the pump and prevent pressure fluctuations which may be present due to long feed lines, high temperature fluids or booster pumps. **It will not eliminate or correct starvation (lack of sufficient fluid to the pump) and will not function with a suction lift.**

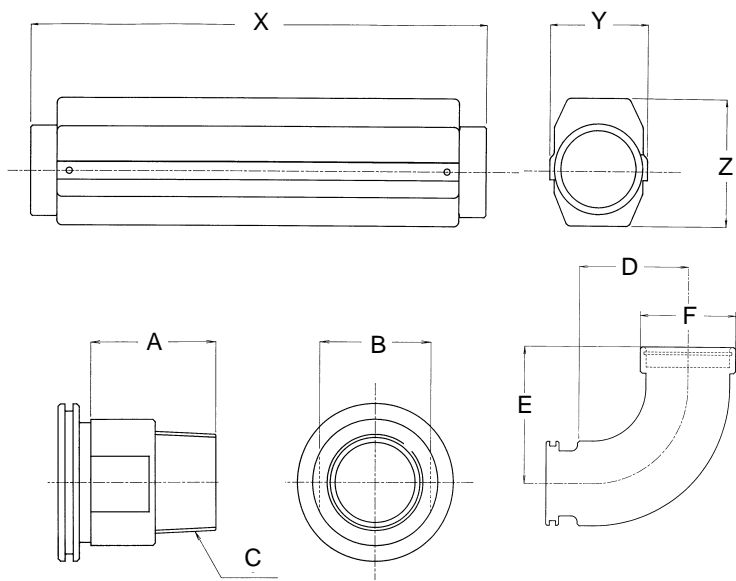
**MAINTENANCE:** With each seal and valve change, check all fitting connections for any leaks. Low pressure, fluctuating pressure or vibration are often the result of poor connections. Use Teflon tape or pipe thread sealant, but stop before the last thread.

*“Customer confidence is our greatest asset”*

## C.A.T. DIMENSIONAL

### Nominal Dimensions (mm)

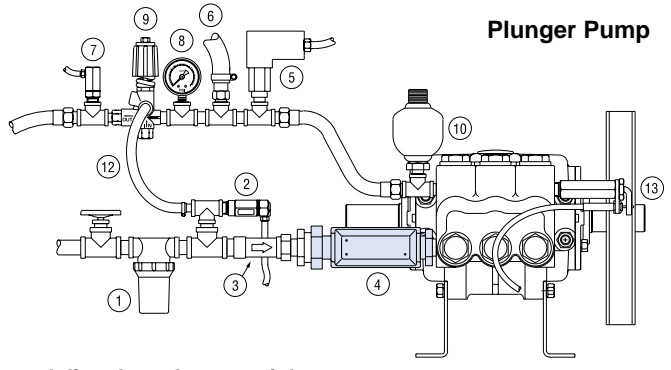
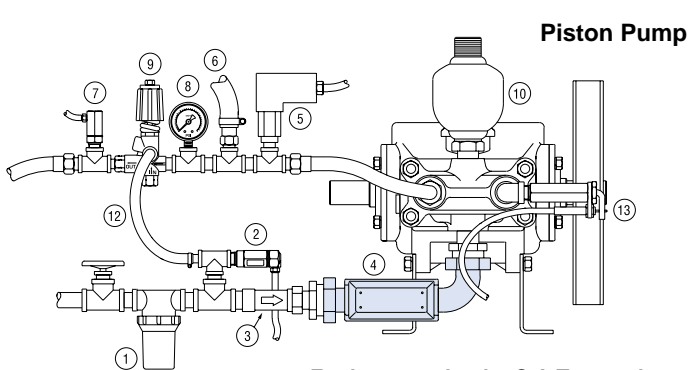
	X	Y	Z			
711500	243	60	75			
714500	432	85	102			
717500	486	95	120			
To Fit 711500	A	B	C	D	E	F
711502	40	27	1/2" NPT			
711503	40	27	3/4" NPT			
711504	40	27	1" NPT			
711505	48	36	1-1/4" NPT			
711506	48	36	1-1/2" NPT			
711511	48	36	1-1/2" BSP			
701818	—	—	1-1/2" NPT	60	68	48
To Fit 714500						
714505	50	46	1-1/4" NPT			
714506	50	46	1-1/2" NPT			
714508	50	27	2" NPT			
714511	50	27	2" BSP			
701828	—	—	2-1/2" NPT	66	87	76
To Fit 717500						
717508	56	55	2" NPT			
717510	56	60	2-1/2" NPT			
717511	56	60	2-1/2" BSP			
701833	—	—	3" NPT	82	104	89



D=Distance from end of C.A.T. X=Extension from end of C.A.T.



## TYPICAL INSTALLATION



**For best results the C.A.T. must be mounted directly to the pump inlet port.**

These illustrations show the basic elements for a typical installation of a high pressure piston or plunger pump. **Not all components shown are required for all applications or systems.** Each component presents potential problems that too often are ascribed to a perfectly functioning pump, such as: a clogged strainer, a partially closed shut-off valve, a faulty gauge, or a malfunctioning regulator/unloader. Proper system installation, routine lubrication, monitoring and maintenance of components are your basic guarantees of optimum pump performance. CAT PUMPS does not assume any liability or responsibility for the design or operation of a customer's high pressure system.

- |   |                               |                        |
|---|-------------------------------|------------------------|
| 1 Inlet Filter                            | 5 Pressure Switch             | 10 Pulsation Dampener★ |
| 2 Thermo Valve                            | 6 Pop-Off Valve               | 11 Chemical Injector   |
| 3 Inlet Pressure Regulator                | 7 Quick Start Valve           | 12 By-Pass Hose        |
| 4 C.A.T. Tube (Captive Acceleration Tube) | 8 Pressure Gauge              | 13 Throttle Controller |
|   | 9 Pressure Regulator/Unloader |                        |

★ Preferred mounting of Pulsation Dampener [Prrrrr-O-Lator] is directly on the discharge manifold of the pump. The preferred mounting of the by-pass hose [when returning to the inlet] is before the Pressure Reducing Valve. If this is not possible, then mount the Prrrrr-O-Lator after the Pressure Unloading Valve to prevent pressure spikes to the pump inlet.

# SIMPLE C.A.T. TUBE STOPS PUMP CAVITATION

## APPLIED FLUID MECHANICS.

The technology of the Captive Acceleration Tube (C.A.T.) is an application of fluid mechanics that has been refined over the last 20 years in the U.K. and overseas. The following is a glimpse of the technology behind the C.A.T.

## WHAT IS CAVITATION?

Cavitation in piston and plunger pumps is caused by the formation and collapse of gaseous cavities in the liquid being pumped and it is the energy of the collapse during the suction stroke which erodes the surfaces of the pump.

The most obvious indication of cavitation is a **hammering noise**. This noise can be either continuous or intermittent depending upon the degree of cavitation. **Vibration** of the pump and system will also be noticeable as the pump becomes starved of fluid. Eventually **flow and pressure will decrease**.

## WHAT IS A C.A.T.?

A C.A.T. is an energy source that releases energy at the frequency needed to ensure that the cylinders are filled from the beginning of the stroke. Once this is achieved, the risk of cavitation is virtually eliminated. Inlet Pulsation Dampeners have been tried as a cure but while they may reduce top of inlet pressure spikes, especially with low speed pumps,

they do nothing to relieve the cavitation regime. A C.A.T., on the other hand, kicks liquid into the cylinder at the required frequency to match the opening of inlet valves of even high speed pumps.

**The C.A.T. is not designed for suction inlet conditions as the energy storing hose inside will collapse and be dysfunctional.**

## WHAT SYSTEMS BENEFIT MOST?

Although most installations of piston and plunger pumps will benefit from a C.A.T., those most in need of one are where the **inlet pressure is boosted**, where the **inlet temperature is high** (over 120°F) and where the **inlet line is long or tortuous**.

## HOW MUCH COULD BE GAINED?

Here are solid facts of what the C.A.T. has achieved for some systems.

In one installation containing two pumps, the annual costs of spares is now only \$176.00 for each pump. this showed a savings of over 90%.

In yet another case, the yearly cost of spares fell from \$1600.00 to \$240.00

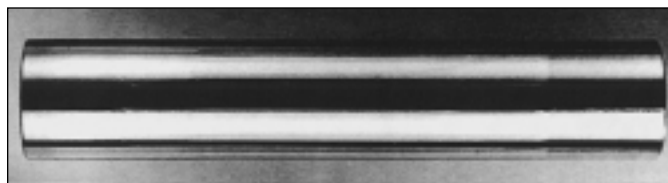
Remember, C.A.T.s are not a gimmick and their cost is not an insignificant part of the price of a pump package. We offer them with the absolute certainty that they will perform the "miracles" we promise when installed properly.

## Spiking Pump Cavitation

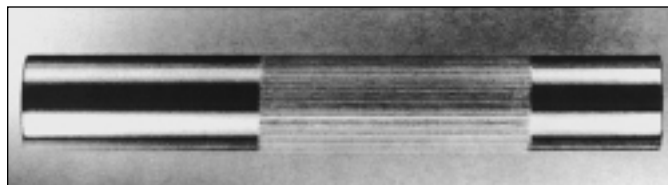
A simple piece of lateral thinking has solved the cavitation problems which can plague piston and plunger pumps. Essentially the solution is a piece of flexible hose which gives a boost as the inlet valve opens. but the effects are dramatic. The director of *CAT PUMPS (UK)* who perfected the concept quotes examples in pumping and water hydraulics where the C.A.T. (captive acceleration tube) has cut maintenance costs by 90%.

The real trick as ever was in isolating the right problem. The design began with work on reverse osmosis systems producing fresh water at sea. There, centrifugal pumps were being used to boost the flow into the main positive displacement pumps (PDP). Where the two were not in tune, cavitation became an horrendous problem unless mammoth pumps were used at low speeds.

The inlet to the PDP was at the heart of the difficulty. If, when the inlet valve opens there is not an immediate flow to the cylinder, then a low pressure regime is followed by a sudden pressure spike rushing in to fill the gap. Traditional solutions had attempted to cut of the top of the pressure spike using an inlet pulsation dampener. However, this was merely treating the symptoms, which in fact follow the low pressure regime, not curing the cause.

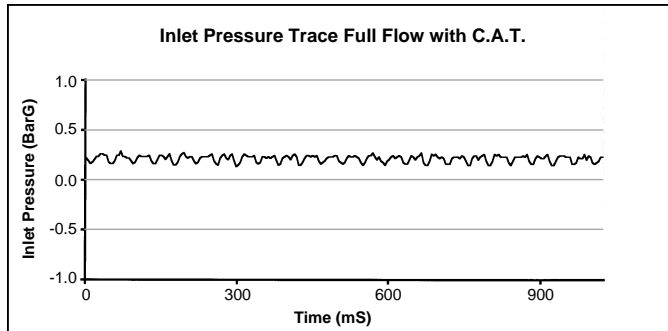
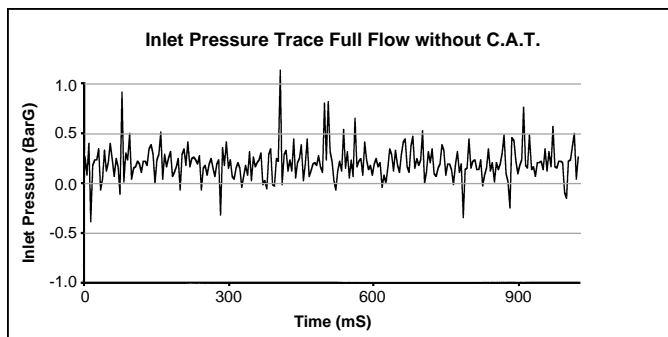


Mild Cavitation



Severe Cavitation

The mechanism by which cavitation damages pumps is complex. The pressure drop forms pockets of vapour in the liquid, which therefore gain latent heat of vaporization. When a vapour pocket touches a metal surface, it loses this heat instantaneously and implodes. The resulting shock wave bounces off an adjacent surface, pulling metal molecules with it. The resulting damage (above) could be mistaken for severe abrasive wear, but can occur no matter how pure the liquid being pumped.



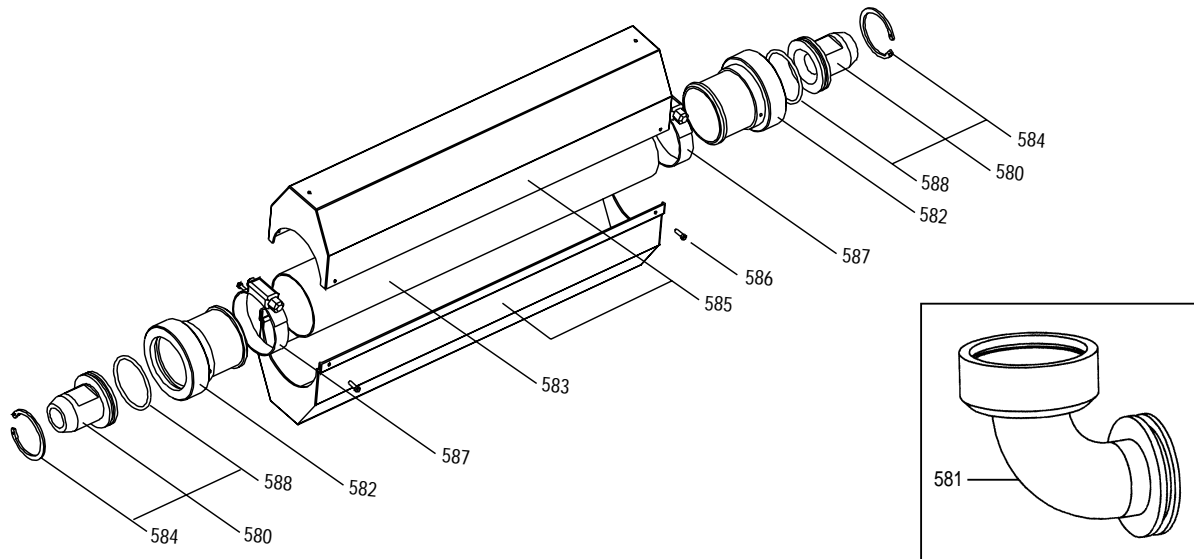
Instead the need was to "kick" the flow into the inlet as soon as it opened to avoid the cylinder running on empty, early on its stroke. Once that has happened, the flow neatly follows demand in a smooth curve with no cavitation and no pressure spike (see graph).

The C.A.T. system uses a piece of flexible hose, which expands slightly, ready to provide this acceleration at the critical inlet opening point. The painstaking part which took twenty years, was to balance hose size and pump frequency.

Main beneficiaries are likely to be in cases where a boost pump is used; where high inlet temperature (over 50°C) lowers vapour pressure at the inlet; and where tortuous inlet lines slow flow acceleration. It cannot be used though where pumps suck or for pressure over 50 psi.

One clear application is in water hydraulics, notably in several British Steel mills. An earlier example at Morganite Crucible, on its hydrostatic press for cold forming pipe fittings illustrates the point. Two triplex plunger pumps replaced gear pumps early in 1985, running periodically at 782 rpm with a 95/5 fluid and pressure to 140 bar. Spares usage after nearly four years only amounted to \$900. The gear pumps were being replaced every three months.

## EXPLODED VIEW



## PARTS LIST

ITEM	DESCRIPTION	MODEL MATL			QTY
		711500	714500	717500	
580	Adapter, Assy, Straight (1/2") [Incls: 584, 588]	711502 SS	—	—	1-2
	Adapter, Assy, Straight (3/4") [Incls: 584, 588]	711503 SS	—	—	1-2
	Adapter, Assy, Straight (1") [Incls: 584, 588]	711504 SS	—	—	1-2
	Adapter, Assy, Straight (1-1/4") [Incls: 584, 588]	711505 SS	714505 SS	—	1-2
	Adapter, Assy, Straight (1-1/2") [Incls: 584, 588]	711506 SS	714506 SS	—	1-2
	Adapter, Assy, Straight (1-1/2" BSP) [Incls: 584, 588]	711511 SS	—	—	1-2
	Adapter, Assy, Straight (2") [Incls: 584, 588]	—	714508 SS	717508 SS	1-2
	Adapter, Assy, Straight (2" BSP) [Incls: 584, 588]	—	714511 SS	—	1-2
	Adapter, Assy, Straight (2-1/2") [Incls: 584, 588]	—	—	717510 SS	1-2
	Adapter, Assy, Straight (2-1/2" BSP) [Incls: 584, 588]	—	—	717511 SS	1-2
581	Elbow, Assy, (1-1/2") [Incls: 584, 588]	701818 SS	—	—	1-2
	Elbow, Assy, (2-1/2") [Incls: 584, 588]	—	701828 SS	—	1-2
	Elbow, Assy, (3") [Incls: 584, 588]	—	—	701833 SS	1-2
582	Barb, Hose, Internal	701816 SS	701826 SS	701831 SS	2
583	Hose, Internal	701819 PPB	701829 PPB	701839 PPB	1
584	Ring, Retaining (Internal)	701767 STNP	701768 STNP	701769 STNP	2
585	Cover, Pair	701815 PVC	701825 PVC	701830 PVC	1
586	Screw, Self Tap (M3x8)	701766 SS	701877 SS	701877 SS	4
587	Hose Clamp	701810 STNP	701820 STNP	701840 STNP	2
588	O-Ring, Adapter	701817 NBR	701827 NBR	701832 NBR	2
—	Pliers, Snap Ring (1.5"-3.5")	33285 STL	33285 STL	33285 STL	1

MATERIAL CODES (Not Part of Part Number):

NBR=Medium Nitrile (Buna-N) PPB=PVC+Polyester+Butyl PVC=PVC SS=316SS STL=Steel STNP=Steel/Nickel Plated

NOTE: Elbow requires standard straight fitting to properly connect.

### TROUBLESHOOTING

- |  |  |
|--|--|
| <p>Water leaking at adapter connection</p> | <ul style="list-style-type: none"> <li>• Worn or missing o-ring.</li> </ul>                              |
| <p>Water leaking from the cover ends</p>   | <ul style="list-style-type: none"> <li>• Cracked or worn hose or improperly tightened clamps.</li> </ul> |

### WARRANTY

**90 Day Warranty**  
Refer to complete Cat Pump Warranty for further information.

Products described hereon are covered by one or more of the following U.S. patents 3558244, 3652188, 3809508, 3920356, 3930756 and 5035580

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