DATA SHEET

HYDRAULIC TUBING DRAIN (HTD)

HTD

DESCRIPTION

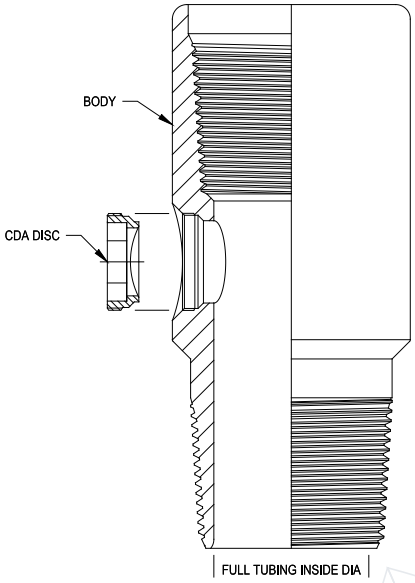
The Fike Hydraulic Tubing Drain (HTD) provides a positive method to equalize the fluid level in tubing strings without mechanical manipulation. The HTD utilizes rupture disc technology to provide accurate and reliable actuation of drain openings downhole. The HTD has been used in many types of wells to eliminate the potential hazards associated with pulling wet tubing strings.

The Fike HTD is simple in design and utilizes applied hydraulic pressure to open an engineered metal disc which creates a fluid drain port to the casing annulus with no restrictions. The HTD consists of the sub and the circulation disc assembly (CDA). The HTD is normally installed box up and pin down at the desired depth in the tubing string.

Fike offers a single port design and a dual port design. On the dual port HTD, CDA's are installed at 180° apart on these drains. These are normally used in highly deviated or horizontal wells.

CIRCULATION DISC ASSEMBLIES

The circulation disc assemblies developed for Fike HTD products are also commonly used as circulation ports for emergency or unplanned uses. Currently there are two disc options for the HTD: A8219 and A8659. Both products allow for fluid circulation with different specifications. Fike CDA discs are typically more accurate and dependable than brass or lead plugs, shear pins, sliding sleeves, or other tubing drain designs.



TYPICAL USE

- When tubing cannot be rotated or pulled to actuate mechanical draining devices
- Where corrosion build up restricts the "S" drain from operating properly
- Drains the tubing to minimize well fluids around the work zone
- Provides a means to pump down the tubing to kill a well before pulling
- Used in conjunction with oversized tubing pumps that do not have operating drain valves
- Drains tubing for submersible pumps equipped with a check valve and pumps in a high angle or straight hole, allowing for fluid circulation

FEATURES AND BENEFITS

- Provides a positive indication of open drain which reduces frequency of stuck tubing or pulling wet strings
- Drains tubing above anchors and packers
- Fike stocks all CDA disc options enabling rapid delivery of required sizes and pressures
- Provides accuracy and dependability that shear pin and mechanical movement devices lack
- Drains or circulates tubing even with the presence of solids, sand, paraffin or corrosion
- Allows producer to use double traveling and standing valves, and still pull dry strings
- Easy to install
- Metal to metal seal ensures dependability at high pressures and temperatures

SPECIFICATIONS

Tubing Sub	
Material	Black oxide coated alloy steel
Thread	Standard API EUE
Scored CDA	
Series	A8219-X
Standard Burst Pressure Range	1,500 to 8,500 PSIG in 500 PSIG increments
Rupture Disc Body Material	Stainless Steel 17-4
Rupture Disc Material	Inconel® 600
Rupture Disc Plug Size	7/8" ID, 1 1/4" External Thread
Burst Tolerance	±5%
Operating Ratio	70% of burst pressure
Back Pressure Tolerance	Minimal. Consider using A8659 series for back pressure applications
Fragmentation	Non-fragmenting

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704 SW 10th Street • P.O. Box 610 • Blue Springs, Missouri 64013-0610 U.S.A.
Phone: 816•229•3405 • www.fike.com

SPECIFICATIONS (CONTINUED)

Non Scored CDA	
Series	A8659-X
Standard Burst Pressure Range	2,500 to 12,000 PSIG in 500 PSIG increments
Rupture Disc Body Material	Stainless Steel 17-4
Inlet Ring Material	Inconel® 600
Rupture Disc Material	Inconel® 600
Rupture Disc Plug Size	5/8" ID, 1 1/4" External Thread
Burst Tolerance	±5%
Operating Ratio	90% of burst pressure
Back Pressure Tolerance	See Table on page 3
Fragmentation	Fragmentation possible
Ordering Information	**Blind Plug:** P/N A8219-200 **HTD Installation Tool:** P/N 02-13627, 3/4" Socket Drive x 7/8" Hex Bit

SINGLE PORT TUBING DRAIN SUB SELECTION GUIDE (P/N A8327-x)								
Sub Fike P/N	**Nominal Size**		**Outside Diameter**		**Drift Diameter**		**Total Length**	
	IN	**mm**	**IN**	**mm**	**IN**	**mm**	**IN**	**mm**
*A8327-1	2-3/8	60	3-1/16	78	1.901	48	7	178
*A8327-4	2-3/8	60	3-5/8	92	1.901	48	7-1/4	184
*A8327-2	2-7/8	73	3-5/8	92	2.347	60	7-1/2	191
*A8327-5	2-7/8	73	4	102	2.347	60	7-3/4	197
*A8327-3	3-1/2	89	4-1/2	114	2.867	73	8-1/8	206
*A8327-6	4	102	5	127	3.351	85	8-3/8	213
*A8327-7	4-1/2	114	5-9/16	141	3.833	97	8-5/8	219

DUAL PORT TUBING DRAIN SUB SELECTION GUIDE (P/N A8327-x)								
Sub Fike P/N	**Nominal Size**		**Outside Diameter**		**Drift Diameter**		**Total Length**	
	IN	**mm**	**IN**	**mm**	**IN**	**mm**	**IN**	**mm**
A8327-11	2-3/8	60	3-1/16	78	1.901	48	7	178
A8327-41	2-3/8	60	3-5/8	92	1.901	48	7-1/4	184
A8327-21	2-7/8	73	3-5/8	92	2.347	60	7-1/2	191
A8327-51	2-7/8	73	4	102	2.347	60	7-3/4	197
A8327-31	3-1/2	89	4-1/2	114	2.867	73	8-1/8	206
A8327-61	4	102	5	127	3.351	85	8-3/8	213
A8327-71	4-1/2	114	5-9/16	141	3.833	97	8-5/8	219

**Indicates Stock Items*
Full tubing inside diameters are standard on all nominal sizes.

SCORED CDA SELECTION GUIDE (P/N A8219-x)			
Disc P/N	**Burst Pressure**	**Disc P/N**	**Burst Pressure**
*A8219-1	1500 PSIG (102 atm)	*A8219-9	5500 PSIG (374 atm)
*A8219-5	2000 PSIG (136 atm)	*A8219-10	6000 PSIG (408 atm)
*A8219-2	2500 PSIG (170 atm)	*A8219-11	6500 PSIG (442 atm)
*A8219-6	3000 PSIG (204 atm)	*A8219-12	7000 PSIG (476 atm)
*A8219-3	3500 PSIG (238 atm)	*A8219-13	7500 PSIG (510 atm)
*A8219-7	4000 PSIG (272 atm)	*A8219-14	8000 PSIG (544 atm)
*A8219-4	4500 PSIG (306 atm)	*A8219-15	8500 PSIG (578 atm)
*A8219-8	5000 PSIG (340 atm)		

NON-SCORED CDA SELECTION GUIDE (P/N A8659-x)					
Disc P/N	**Burst Pressure**	**Maximum Back Pressure**	**Disc P/N**	**Burst Pressure**	**Maximum Back Pressure**
*A8659-6	2500 PSIG (170 atm)	570 PSIG (39 atm)	*A8659-12	7500 PSIG (510 atm)	750 PSIG (51 atm)
*A8659-2	3000 PSIG (204 atm)	750 PSIG (51 atm)	*A8659-8	8000 PSIG (544 atm)	750 PSIG (51 atm)
*A8659-9	3500 PSIG (238 atm)	750 PSIG (51 atm)	*A8659-13	8500 PSIG (578 atm)	750 PSIG (51 atm)
*A8659-3	4000 PSIG (272 atm)	750 PSIG (51 atm)	*A8659-14	9000 PSIG (612 atm)	750 PSIG (51 atm)
*A8659-5	4500 PSIG (306 atm)	750 PSIG (51 atm)	*A8659-15	9500 PSIG (646 atm)	750 PSIG (51 atm)
*A8659-1	5000 PSIG (340 atm)	750 PSIG (51 atm)	*A8659-16	10,000 PSIG (680 atm)	750 PSIG (51 atm)
*A8659-10	5500 PSIG (374 atm)	750 PSIG (51 atm)	*A8659-17	10,500 PSIG (714 atm)	750 PSIG (51 atm)
*A8659-4	6000 PSIG (408 atm)	750 PSIG (51 atm)	*A8659-18	11,000 PSIG (749 atm)	750 PSIG (51 atm)
*A8659-11	6500 PSIG (442 atm)	750 PSIG (51 atm)	*A8659-19	11,500 PSIG (783 atm)	750 PSIG (51 atm)
*A8659-7	7000 PSIG (476 atm)	750 PSIG (51 atm)	*A8659-20	12,000 PSIG (817 atm)	750 PSIG (51 atm)

**Indicates Stock Items*
Consult Fike for additional pressures and performance limitations.

CIRCULATION DISC ASSEMBLY BURST PRESSURE/TEMPERATURE CONVERSION TABLE (P/N A8219-x and A8659-x)							
Scored Disc P/N	**Non-Scored Disc P/N**	**Burst Pressure @ Temp (PSIG)**					
		72°F (22°C)	**100°F (38°C)**	**200°F (93°C)**	**300°F (149°C)**	**400°F (204°C)**	**500°F (260°C)**
A8219-1	NA	**1500**	1485	1442	1419	1409	1403
A8219-5	NA	**2000**	1980	1922	1892	1878	1870
A8219-2	A8659-6	**2500**	2475	2403	2365	2348	2338
A8219-6	A8659-2	**3000**	2970	2883	2838	2817	2805
A8219-3	A8659-9	**3500**	3465	3364	3311	3287	3273
A8219-7	A8659-3	**4000**	3960	3844	3784	3756	3740
A8219-4	A8659-5	**4500**	4455	4325	4257	4226	4208
A8219-8	A8659-1	**5000**	4950	4805	4730	4695	4675
A8219-9	A8659-10	**5500**	5445	5286	5203	5165	5143
A8219-10	A8659-4	**6000**	5940	5766	5676	5634	5610
A8219-11	A8659-11	**6500**	6435	6247	6149	6104	6078
A8219-12	A8659-7	**7000**	6930	6727	6622	6573	6545
A8219-13	A8659-12	**7500**	7425	7208	7095	7043	7013
A8219-14	A8659-8	**8000**	7920	7688	7568	7512	7480
A8219-15	A8659-13	**8500**	8415	8169	8041	7982	7948
-	A8659-14	**9000**	8910	8649	8514	8451	8415
-	A8659-15	**9500**	9405	9130	8987	8921	8883
-	A8659-16	**10000**	9900	9610	9460	9390	9350
-	A8659-17	**10500**	10395	10091	9933	9860	9818
-	A8659-18	**11000**	10890	10571	10406	10329	10285
-	A8659-19	**11500**	11385	11052	10879	10799	10753
-	A8659-20	**12000**	11880	11532	11352	11268	11220

CDA BURST PRESSURE CALCULATION

Purpose: To select the proper circulation disc assembly by evaluating all known forces (pressure components) which will be applied to the disc and determine the operational differential pressure that the disc will see in normal service. Please refer to the web-based CDA selection tool which can be found at http://fike.com/products/ofhtdcalc.asp

	Instructions	**Example**
Step 1	Typically, well fluid density is given in pounds per gallon (ppg). Determine the Fluid Density in PPG or convert to PPG if applicable.	Density of produced salt water = 10.0 PPG
Step 2	Convert to psi/ft by multiplying by the factor 0.051981	10.0 (lb/gal) x 0.051981 = 0.520 PSIG/ft
Step 3	Determine the true vertical depth (ft) (TVD) of the HTD at actuation. In determining the TVD and applied differential pressure the user must consider factors such as if the well is partially pumped off, pumped off completely, back pressure, and any other factors that may affect the differential pressure applied to the rupture disc Recommended practices: The tubing drain should always be placed at least 2 production tubing joints (~ 32 ft / joint, or ~ 64 feet) above the pump for non-sand producing wells and 4 pipe joints (~ 124 feet) above the pump for sand producing wells.	TVD = 8000 (ft), the HTD sub is placed two joints above the pump. Perforations and bottom of pump Assembly is 8,070 ft, HTD sub is at 8000 ft.
Step 4	Multiply the density factor (psi/ft) by the TVD (ft) to obtain the hydrostatic pressure.	0.520 (PSIG/ft) x 8000 (ft)= 4160 PSIG
Step 5	Consider and apply friction pressure and system pressure. Reference recommendation A *Note: If unknown use example pressures.*	200 PSIG friction pressure + 200 PSIG system pressure + 4160 hydrostatic pressure =4560 psi
Step 6	Factor in the operating ratio, the burst tolerance and a recommended safety factor Divide by 0.60 for the A8219 disc, or .80 for the A8659 disc. This ensures the operating ratio (70%, 90%) is not exceeded as well as a worst case scenario for burst tolerance (±5%) and the factory recommended safety factor (5%) Reference recommendation D.	A8219 = 4560 PSIG/0.60 = 7600 PSIG A8659 = 4560 PSIG/0.80 = 5700
Step 7	Determine HTD temperature at the desired actuation depth. One method to "estimate" the Bottom Hole Static Temperature (BHST), is to use a temperature gradient of temperature rise due to depth. A commonly used temperature gradient is 1.6°F/100 ft of vertical depth. Reference recommendation B	In this case, at 8000 ft, with a temperature gradient of 1.6 the BHST is 70°F (standard ambient temperature below ground, non-weather affected). Total Temp would be 8000/100* 1.6 = 128 + 70 or 198°F.
Step 8	Refer to the temperature conversion table on Page 4. Using the burst pressure calculated in step 7, select the first disc with a burst pressure that is higher than the calculated burst pressure in the applicable temperature column. This represents the minimum burst pressure that should be selected for use in the example. *Note: The user is encouraged to select a higher burst pressure to increase the safety factor but should never exceed the internal burst rating of the tubing. Tubing should be de-rated appropriately due to the overall condition of the tubing considering such factors as corrosion, time in service, and other well conditions.* *Reference recomendation C* Important: Always use approved tubing tables for determining internal yield pressure of the tubing. These can be obtained from the American Piping Institute or other sources such as TMK IPSCO or Schlumberger.	Find the value(s) above 7600 PSIG for the A8219 disc at 200°F column of the chart. Select A8219-14 through A8219-15 (scored). Find the value(s) above 5700 PSIG for the A8659 disc at 200°F column of the chart. Select A8659-4 through A8659-20 (non-scored). Per API Tubing Tables if tubing is 2.875" Nom Dia, 6.5 lb/ft, L80 Grade the internal yield pressure is = 10,570 PSIG for new tubing. Therefore a maximum burst pressure of up to 10,500 PSIG should be safe for new tubing. This prohibits use of discs A8659-18 through -20 in the above example. If the tubing is not "new", well operator should consider condition of the tubing and select a disc which will burst below tubing burst.

US patent: 6,752,212 and 6,591,915 and foreign patents

Form No. O.1.05.01-4, March 2014. Specifications are subject to change without notice.