

USER'S GUIDE Installation & Operation Instructions

SAFSONIC DFS2 DOPPLER FLOW SWITCH (With rate indicator and relay)



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Introduction

The **Flowmetrix DSF2 Flow Switch** measures the velocity of fluids in pipelines using a totally non-intrusive principle.

NB! It is intended for use with sewage, pulps, mining slurries, and other fluids which contain in excess of **0,1% suspended solids** or bubbles. The particle size for successful operation **must be** greater than 100 microns.

The DFS2 enclosure is rated IP65. The flow switch includes a relay with adjustable high and low set point controls, plus delay-on and delay-off adjustable timers. The DFS2 requires 24Vdc, 115 or 230Vac power supply.

Two selectable flow ranges of 0 – 2 m/s, or 0 – 6 m/s are available, and the flow rate is displayed on a bar graph indicator.

Sensor mounting

Location

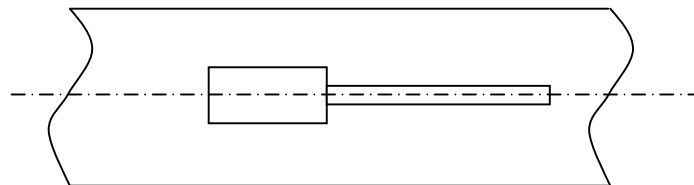
- Select a location for mounting the sensor at a point where the flow profile is fully developed. Generally the principle of 10 pipe diameters of straight pipe upstream, and 5 pipe diameters downstream will suffice, but should valves or bends exist upstream of the sensor, the amount of straight pipe immediately upstream will need to be increased.
- Ensure that the sensor is mounted as far as possible from potential noise sources, such as pumps, control valves etc. and mount the sensor at approximately 3/9 o'clock on the pipe (if horizontal) to avoid errors due to air pockets on top, or sediment at the bottom of the pipe.
- Either vertical-up or horizontal pipe runs are acceptable for sensor mounting. Vertical down flow should be avoided.

Surface preparation

- Before attaching the transducer head to the pipe surface, an area slightly larger than the flat surface of the transducer must be cleaned to bare metal. (A small amount of pipe pitting, even with spots of paint or rust, will not cause problems).

Orientation

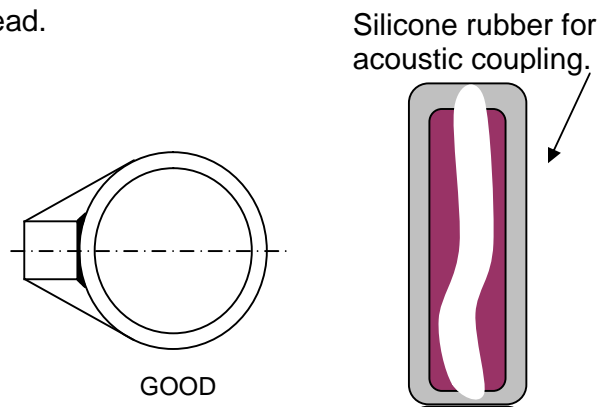
- The transducer must be mounted accurately, parallel to the pipe axis, for correct performance, and transducer to pipe contact should be along the centre line of the transducer head.



SIDE VIEW - 3 O'CLOCK POSITION ON
PIPE IF HORIZONTAL

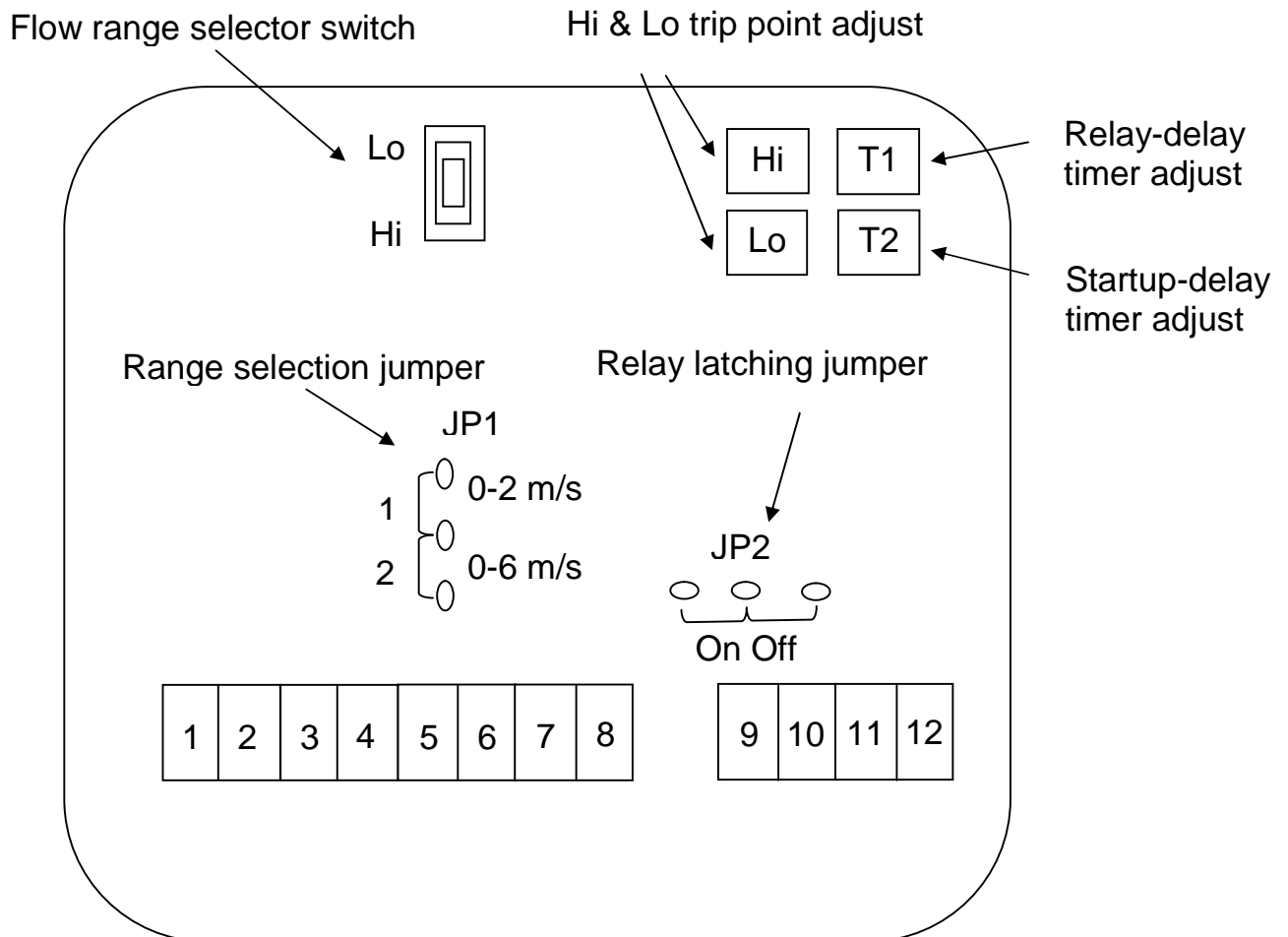
Ultrasonic Bonding

- **The sensor must have no air gaps between it and the pipe.** Bonding to the pipe is achieved with silicone coupling compound between the sensor face and pipe. Hold the sensor steady during tensioning of straps to limit sensor movement. Be sure to fill in any air gaps that may remain at the pipe transducer interface with additional compound.
- A pipe clamp kit is included with the flow meter. It includes silicone coupling compound, a Neoprene rubber pad, and straps for pipe diameters up to 600mm. In applications with excessive vibration it is recommended that the Neoprene rubber pad is inserted between the pipe and the transducer. Coupling compound must be applied to both sides of the pad.
- Steel band strapping tools and steel strapping for installation of sensors provide excellent sensor strap tension, however care should be taken not to damage sensor with excessive force.



Connections and Setup

Press the cover screws and turn one ¼ turn and release. Lift the switch cover to reveal the plug-in connections and various setup options.



TERMINAL NO.

1.Live/Positive (+)	7.Start-up-delay reset 12V+
2.Neutral/Negative (-)	8.Start-up-delay reset 12V-
3.Earth	9.Sensor TX (Yellow)
4.Relay NO	10.Screen TX (Green)
5.Relay NC	11.Screen RX (White)
6.Relay C	12.Sensor RX (Brown)

Mounting the Switch/ Display

The DFS2 electronics is housed in a water resistant housing, which should be mounted in a location where the ambient temperature is within the range stated in the specifications i.e. -10°C to 50°C.

Connections

Sensor

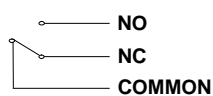

Connect the sensor to the 4-way terminal plug as indicated. Terminal No's 9 to 12.

Power Input

Check that the operating voltage of the flow switch matches the intended supply voltage, (i.e. 24Vdc, 115Vac or 230Vac) before connecting the power supply.

Relay

The relay has a changeover contact, Form C type with C NO NC, which can be used for pump control, or simply to initiate an alarm condition. The single control relay will operate when the flow measured is outside the high or low trip settings and can be configured to operate with or without a "latch" function.

OUTPUT	DFM2 TERMINALS	EXT. CIRCUIT	SIGNAL
Relay Output		 Relay Mechanical Totaliser Etc.	Relay NC/NO contacts <1A 125VAC <2A 30VDC

Pump protection

If used for pump protection either power the DFS2 from the pump circuit or close reset contact on start up allowing normal flow conditions to be established before T2 timer times out. If the timer times out and flow has not yet been established, the relay will de-energise and latch again. For settings see "JP2 – ON" below.

Setup

Latch Selection

JP2 – ON (latch/reset)

Relay energised in normal conditions i.e. between high and low limits giving a failsafe mode.

In alarm condition the relay will de-energise and latch in the de-energised position.

Close reset contact (7 & 8) to reset relay to energised position. Resetting the relay will also reset timer T2.

If alarm condition remains after T2 timer times out the relay will again de-energise and latch.

JP2 – OFF (No latch/reset)

Relay is de-energised in normal conditions i.e. between high and low limits.

In alarm conditions the relay will energise.

Range Selection : (refer JP1)

Range 1 (0 – 2 m/s) :- Jumper in position “1”

Range 2 (0 – 6 m/s) :- Jumper in position “2”

Setting Low Flow Trip Point :

Move slide switch “S1” to “Lo” position. Adjust the low trip potentiometer until the bar graph displays the required alarm setting as a percentage of the flow range selected.

Example : Range 1 (0 – 2 m/s)
Bar graph display – 50%
Trip point setting – 1,0 m/s

Setting High Flow Trip Point

Move slide switch “S1” to “Hi” position and adjust high trip potentiometer to display the required alarm setting.

NB Return slide switch to centre position for normal operation.

Delay-Off Timer T1 :

Under normal operating conditions the flow may fluctuate beyond the high or low trip settings momentarily. The adjustable 0 – 60 sec. timer is adjusted with potentiometer “T1”. Turn clockwise to increase the delay before the relay operates.

Delay-On Timer T2 :

If the flow switch is used for pump control it is necessary to over-ride the trip settings during start-up, until the flow is established.

The adjustable 0 – 60 sec. timer is adjusted with potentiometer “T2”. Turn clockwise to increase the delay before the relay operates.

FLOW RATE GUIDE

PIPE SIZE (mm)	PIPE SIZE (INCH)	FLOWRATE @ 1m/s (3ft/s)				FLOWRATE @ 10m/s (30ft/s)			
		(l/s)	m3/hr	ft3/s	gal(US)/s	(l/s)	m3/hr	ft3/s	gal(US)/s
25	1	0.5	1.8	0.02	0.13	5	18	0.18	1.32
40	1.6	1.25	4.5	0.04	0.33	12.5	45	0.44	3.30
50	2	2	7.2	0.07	0.53	20	72	0.71	5.28
65	2.6	3.3	11.9	0.12	0.87	33	118.8	1.17	8.72
80	3.2	5	18.0	0.18	1.32	50	180	1.77	13.2
100	4	8	28.8	0.28	2.11	80	288	2.83	21.1
125	5	12	43.2	0.42	3.17	120	432	4.24	31.7
150	6	18	64.8	0.64	4.75	180	648	6.36	47.5
200	8	31	111.6	1.09	8.19	310	1116	10.95	81.9
250	10	49	176.4	1.73	12.9	490	1764	17.30	129.4
300	12	70	252.0	2.47	18.5	700	2520	24.72	184.9
350	14	96	345.6	3.39	25.4	960	3456	33.90	253.5
400	16	125	450.0	4.41	33.0	1250	4500	44.14	330.1
450	18	159	572.4	5.62	42.0	1590	5724	56.15	419.9
500	20	196	705.6	6.92	51.8	1960	7056	69.22	517.6
600	24	283	1018.8	9.99	74.7	2830	10188	99.94	747.4
700	28	385	1386.0	13.60	101.7	3850	13860	135.96	1016.8
750	30	442	1591.2	15.61	116.7	4420	15912	156.09	1167.3
800	32	500	1800.0	17.66	132.1	5000	18000	176.57	1320.5

Trouble Shooting

Relay Operates With No Flow	
Possible Cause	<ul style="list-style-type: none"> - Trip points set too low - Vibration on pipe
Corrective Action	<ul style="list-style-type: none"> - Adjust trip points above 0 m/s - Relocate transducer - Use Neoprene rubber pad in transducer mounting
Relay Does Not Operate	
Possible Cause	<ul style="list-style-type: none"> - High trip point set below Low trip point - Unit faulty
Corrective Action	<ul style="list-style-type: none"> - Adjust High trip point above Low trip point - Return unit to factory
Signal Strength LED Not Illuminated, or Flickering slowly	
Possible Cause	<ul style="list-style-type: none"> - No flow - Insufficient suspended solids in fluid - Bad coupling of transducer - Incorrect transducer connections
Corrective Action	<ul style="list-style-type: none"> - Confirm flow - Inject air into pipeline - Check transducer mounting - Check transducer connections

Features & Specifications

Measuring Range	0.1 to 2.0 m/s 0.1 to 6.0 m/s
Liquids	Containing 0.01% solids >100micron
Pipes	25-3000mm (1"-120") Most pipe materials
Accuracy	±2% of Rate for velocities >0.5m/s (1.6ft/s)
Repeatability	±2%
Indication	10 LED bar graph Range selection Hi and Lo Alarm Signal Strength
Units	Velocity m/s (ft/s)
Power Supply	115/230Vac ±10%, 50/60Hz, (<6VA) 24VDC, ±10% (<4W)
Isolated Outputs	Relay Form C (1A 125VAC, 2A 30VDC)
Delay Times	0 – 60 seconds
Electronics enclosure	IP67 (NEMA 6) Polycarbonate Wall Mount 125 x 125 x 75mm HxWxD (5" x 5" x 3")
Transducer	IP68 (NEMA 6P) Aluminium epoxy-faced 21 x 80 x 28mm HxWxD (0.8" x 3" x 1.1")
Temperature limits	Sensor -20 to 90°C (-4 to 194°F) Electronics -10 to 50°C (14 to 122°F)
Shipping Weight	36 x 20 x 13cm (15" x 10" x 5.2"), 1.2kg (3lbs)
Set points	Two set points, Hi & Lo, 0 to 100% of range at 10 intervals
Inputs	Startup-delay timer reset
Sensor Cable length	3m (9ft)
Failsafe mode	Selectable relay latching on/off
Model No.	DFS2-1 (115VAC 50/60Hz) DFS2-2 (230VAC 50/60Hz) DFS2-3 (24VDC)
Model Example	DFS2-1 = 115VAC 50/60Hz
Standards	CE Certified

Warranty

Flowmetrix SA warrants to the purchaser that the equipment to be delivered to hereunder will be free from defects in materials, workmanship and title and will be free of the kind and quality designated in the proposal.

The foregoing warranty is exclusive and in lieu of all other warranties whether express or implied including any warranty of merchantability or of fitness for a particular purpose.

Warranties other than the above will only be effective if written and signed by an officer of Flowmetrix SA

If within 1 (one) year from the date of delivery, the equipment delivered hereunder does not meet the warranties specified above, Flowmetrix SA shall thereupon correct such defects, at its sole discretion, either by repairing or by replacing the instrument in its entirety.

The costs of returning the equipment to Flowmetrix SA and for the repaired or replaced item being returned to the purchaser shall be for the account of the purchaser.

The liability of Flowmetrix SA is conditioned upon the equipment covered hereunder being handled, installed, operated, maintained, stored or used, as the case may be, in strict accordance with the written instructions or technical direction supplied by Flowmetrix SA, and is further conditioned upon the purchasers prompt written notice (within 30 days) to Flowmetrix SA of such defects.

Flowmetrix SA makes no warranties which extend to the items covered hereby due to improper handling, installation, operation, maintenance, storage or use; abnormal or undisclosed environmental conditions; or operating or use in an otherwise improper manner. The liability of Flowmetrix SA to the purchaser, except as to title, arising out of the supplying of the equipment or its use, under this warranty article, shall not, in any case, exceed the cost of correcting defects in the equipment as herein provided and upon the expiration of the warranty described herein, all such warranty liability shall terminate. The foregoing shall constitute sole warranty remedy of the purchaser and the sole warranty liability of Flowmetrix SA.

Goods Return Procedure

Damaged or defective equipment should be returned to the supplier prepaid. Do not return goods until written authorisation to do so has been obtained. Returned goods must have accompanying them a letter stating the following:

- Your company name and order number
- The contact person at your company
- Serial number and name of product
- Description of damage and cause if known
- Nature of any repair attempted by the user
- Type of repair, replacement or adjustment requested
-

ASA steel pipe schedules

			ANSI B36.19								ANSI B36.10			
DN	Outside diameter mm	NPS	Schedule											
			5S		10S		40S/STD		80S/XS		STD		XS	
			Wall thickness and weight kg/mm											
			mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m
8	10.3	1/8			1.24	0.28	1.73	0.37	2.41	0.48				
8	13.7	1/4			1.65	0.50	2.24	0.64	3.02	0.81				
10	17.2	3/8			1.65	0.64	2.31	0.86	3.20	1.12				
15	21.3	1/2	1.65	0.81	2.11	1.01	2.77	1.28	3.73	1.64				
20	26.7	3/4	1.65	1.03	2.11	1.3	2.87	1.71	3.91	2.23				
25	33.4	1	1.65	1.31	2.77	2.12	3.38	2.54	4.55	3.28				
32	42.2	1 1/4	1.65	1.67	2.77	2.73	3.56	3.44	4.85	4.53				
40	48.3	1 1/2	1.65	1.92	2.77	3.15	3.68	4.11	5.08	5.49				
50	60.3	2	1.65	2.42	2.77	3.99	3.91	5.51	5.54	7.59				
65	73.0	2 1/2	2.11	3.74	3.05	5.34	5.16	8.75	7.01	11.6				
80	88.9	3	2.11	4.58	3.05	6.55	5.49	11.5	7.62	15.5				
100	101.6	3 1/2	2.11	5.25	3.05	7.52	5.74	13.8	8.08	18.9				
100	114.3	4	2.11	5.92	3.05	8.49	6.02	16.3	8.56	22.6				
125	141.3	5	2.77	9.60	3.40	11.7	6.55	22.1	9.53	31.4				
150	168.3	6	2.77	11.5	3.40	14.0	7.11	28.7	10.97	43.2				
200	219.1	8	2.77	15.0	3.76	20.2	8.18	43.1	12.70	65.6				
250	273.0	10	3.4	22.9	4.19	28.2	9.27	61.1	12.70	82.7				
300	323.9	12	3.96	31.7	4.57	36.5	9.53	74.9	12.70	98.8				
350	355.6	14	3.96	34.8	4.78	41.9			9.53	82.5	12.70	109		
400	406.4	16	4.19	42.1	4.78	48.0			9.53	94.6	12.70	125		
450	457	18	4.19	47.4	4.78	54.1			9.53	107	12.70	141		
500	508	20	4.78	60.2	5.54	69.6			9.53	119	12.70	157		
	559	22	4.78	66.2	5.54	76.7			9.53	131	12.70	173		
600	610	24	5.54	83.7	6.35	95.9			9.53	143	12.70	190		
	660	26							9.53	155	12.70	206		
700	711	28							9.53	167	12.70	222		
	762	30	6.35	120	7.92	149			9.53	179	12.70	238		
800	813	32							9.53	191	12.70	254		
	864	34							9.53	204	12.70	270		
900	914	36							9.53	216	12.70	286		
	965	38							9.53	228	12.70	303		
1000	1016	40							9.53	240	12.70	319		
	1067	42							9.53	252	12.70	335		
	1118	44							9.53	264	12.70	351		
	1168	46							9.53	276	12.70	367		
	1219	48							9.53	288	12.70	383		
	1321	52							9.53	313	12.70	417		
	1422	56							9.53	339	12.70	449		
	1524	60							9.53	362	12.70	482		
	1626	64							9.53	387	12.70	514		

ANSI B36.10

DN	Outside diameter mm	NPS	Schedule													
			10		20		30		40		60		80		120	
			Wall thickness and weight kg/mm													
			mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m
8	10.3	1/8	1.24	0.28					1.73	0.37			2.41	0.48		
8	13.7	1/4	1.65	0.50					2.24	0.64			3.02	0.81		
10	17.2	3/8	1.65	0.64					2.31	0.86			3.20	1.12		
15	21.3	1/2	2.11	1.01					2.77	1.28			3.73	1.64		
20	26.7	3/4	2.11	1.30					2.87	1.71			3.91	2.23		
25	33.4	1	2.77	2.12					3.38	2.54			4.55	3.28		
32	42.2	1 1/4	2.77	2.73					3.56	3.44			4.85	4.53		
40	48.3	1 1/2	2.77	3.15					3.68	4.11			5.08	5.49		
50	60.3	2	2.77	3.99					3.91	5.51			5.54	7.59		
65	73.0	2 1/2	3.05	5.34					5.16	8.75			7.01	11.6		
80	88.9	3	3.05	6.55					5.49	11.5			7.62	15.5		
100	101.6	3 1/2	3.05	7.52					5.74	13.8			8.08	18.9		
100	114.3	4	3.05	8.49					6.02	16.3			8.56	22.6	11.13	28.7
125	141.3	5	3.40	11.7					6.55	22.1			9.53	31.4	12.70	40.8
150	168.3	6	3.40	14.0					7.11	28.7			10.97	43.2	14.27	55.0
200	219.1	8	3.76	20.2	6.35	33.8			8.18	43.1	10.31	53.8	12.70	65.6	18.26	91.7
250	273.0	10	4.19	28.2	6.35	42.3	7.8	51.7	9.27	61.1	12.70	82.7	15.09	97.3	21.44	135
300	323.9	12	4.57	36.5	6.35	50.4	8.38	66.1	10.31	80.9	14.27	110	17.48	134	25.40	190
350	355.6	14	6.35	55.5	7.92	68.9	9.53	82.5	11.13	95.9	15.09	128	19.05	160	27.79	228
400	406.4	16	6.35	63.5	7.92	78.9	9.53	94.6	12.7	125	16.66	162	21.44	206	30.96	291
450	457	18	6.35	71.6	7.92	88.9	11.13	124	14.27	158	19.05	209	23.83	258	34.93	369
500	508	20	6.35	79.7	9.53	119	12.70	157	15.09	186	20.62	251	26.19	316	38.10	448
	559	22	6.35	87.8	9.53	131	12.70	173			22.23	298	28.58	379	41.28	534
600	610	24	6.35	95.9	9.53	143	14.27	213	17.48	259	24.61	360	30.96	448	46.02	649
	660	26	7.92	129	12.70	206										
700	711	28	7.92	139	12.70	222	15.88	276								
	762	30	7.92	149	12.70	238	15.88	296								
800	813	32	7.92	159	12.70	254	15.88	317	17.48	348						
	864	34	7.92	170	12.70	270	15.88	337	17.48	370						
900	914	36	7.92	179	12.70	286	15.88	357	19.05	426						
	965	38	9.53	228	12.70	302	15.88	377								
1000	1016	40	9.53	240	12.70	319	15.88	397								
	1067	42	9.53	252	12.70	335	15.88	417								
	1118	44	9.53	264	12.70	351	15.88	438								
	1168	46	9.53	276	12.70	367	15.88	458								
	1219	48	9.53	288	12.70	383	15.88	478								
	1321	52	9.53	313	12.70	416	15.88	518								
	1422	56	9.53	337	12.70	448	15.88	558								
	1524	60	9.53	361	12.70	480	15.88	599								
	1626	64	9.53	385	12.70	512	15.88	639								

The table shows a part of the ANSI B36.10 standard;
some of these dimensions are outside AST's production programme.