HEATEC TEC-NOTE

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Setting Siemens Pressure Transmitter

Used on Heatec Vertical Asphalt Tanks

This document provides information on setting Siemens pressure transmitters used on Heatec vertical asphalt tanks TAV-10, TAV-15, TAV-20, TAV-25, TAV-30 and TAV-35 **(Figure 1).** It applies to Siemens Sitrans P, Series DSIII pressure transmitter **7MF4033-1CY10-1NC6-Z+B21Y01 (Figure 2)** (fitted with remote seal (sensor) 7MF4810-2QA02)**.**

Sensors of transmitters installed at Heatec are at a height of 11 inches above the bottom of the tank. Sensors of transmitters retrofitted in the field are usually installed in the drain outlet, which is only 2.5 inches above the bottom of the tank. Different sensor heights require different settings.

These tanks are used to store liquid asphalt. The transmitter indicates the *level* of liquid material in the tank.

This document also provides information for converting levels to gallons.

In addition to this document, Siemens User's Manual UMSITRPDS3-1 is also furnished.

The information in these two documents should enable users of Heatec tanks to reset the transmitters in the field. Although the transmitters are preset at the Heatec factory before the tanks are shipped, users may need to change their settings for different liquid materials.

NOTICE

This document supplements the Siemens manual and should always be used along with the Siemens manual. Be sure to read all appropriate warnings and precautions in the Siemens manual before doing any work on Siemens transmitters. The following statement appears in the front of the Siemens manual and should be followed:

> **Qualified Persons**
> The described equipment should be installed, configured, operated, and serviced only by qualified persons

Figure 1. Heatec vertical asphalt tanks.

Figure 2. Siemens pressure sensor and transmitter.

thoroughly familiar with this User's Manual. A copy of this manual accompanies the equipment. The current version of the manual, in Portable Document Format (PDF), can be downloaded from www.sea.siemens.com/ia/.

FACTORY SETTINGS

The transmitter is normally set at Heatec before the tank is shipped. It is set to display the level of the liquid material in the tank in ***inches*** (Figure 3). This setting *cannot* be changed in the field by plant personnel.

Figure 3. Display on transmitter.

Heatec also sets the transmitter based on the specific gravity of the material that is to be stored in the tank. The customer provides this information and we use it to determine the proper setting. However, the transmitter can be reset in the field by plant personnel for a material with a different specific gravity.

NOTICE

You should check the transmitter to make sure it is set for the specific gravity of the material actually stored in the tank. If its specific gravity is either higher or lower than that set on the transmitter, the transmitter will not provide accurate level indications.

To determine the transmitter specific gravity setting, set the transmitter to Mode 6, which is the Full Scale Blind Setting. Read the numerical value shown. Now find that same value in Figure 4, where you can see the specific gravity for that value.

Remember, specific gravities vary with the type of asphalt. And the specific gravity of a particular type of asphalt varies with its temperature. So if you decide to store a different material, or if you change its storage temperature, you need to reset the transmitter as explained below.

If you don't know the specific gravity of the material at the temperature you plan to store it, ask your supplier.

RESETTING THE TRANSMITTER

NOTE: You *cannot* directly enter the numerical value for specific gravity when resetting the transmitter. The setting you actually set on the transmitter is known as the **Full scale blind setting,** which you should obtain from **Figure 4 or 4A,** depending on the height of the sensor. It consists of a four digit number that includes one decimal point.

Thus, to obtain a full scale blind setting for an asphalt with a known specific gravity, simply choose a specific gravity value shown in **Figure 4 or 4A** with a value closest to your known value. Then note the full scale blind setting shown alongside the specific gravity listed. **Be sure the specific gravity you use is for the actual storage temperature of the asphalt and not its temperature at 60 degrees F.**

Figure 4. Specific Gravity Vs Full Scale Blind Setting. (11-inch sensor height)

Specific Gravity	Full Scale Blind Setting	Specific Gravity	Full Scale Blind Setting
1.140	671.5	1.015	597.8
1.135	668.5	1.010	594.9
1.130	665.6	1.005	591.9
1.125	662.6	1.000	589.0
1.120	659.7	0.995	586.1
1.115	656.7	0.990	583.1
1.110	653.8	0.985	580.2
1.105	650.8	0.980	577.2
1.100	647.9	0.975	574.3
1.095	645.0	0.970	571.3
1.090	642.0	0.965	568.4
1.085	639.1	0.960	565.4
1.080	636.1	0.955	562.5
1.075	633.2	0.950	559.6
1.070	630.2	0.945	556.6
1.065	627.3	0.940	553.7
1.060	624.3	0.935	550.7
1.055	621.4	0.930	547.8
1.050	618.5	0.925	544.8
1.045	615.5	0.920	541.9
1.040	612.6	0.915	538.9
1.035	609.6	0.910	536.0
1.030	606.7	0.905	533.0
1.025	603.7	0.900	530.1
1.020	600.8		

The full scale blind setting is equal to a tank height of 600 inches minus the sensor height of 11 inches multiplied by the specific gravity of the asphalt.

Figure 4A. Specific Gravity Vs Full Scale Blind Setting. (2.5 inch sensor height)			
Specific Gravity	**Full Scale Blind Setting**	**Specific Gravity**	**Full Scale Blind Setting**
1.140	681.2	1.015	606.5
1.135	678.2	1.010	603.5
1.130	675.2	1.005	600.5
1.125	672.2	1.000	597.5
1.120	669.2	0.995	594.5
1.115	666.2	0.990	591.5
1.110	663.2	0.985	588.5
1.105	660.2	0.980	585.6
1.100	657.3	0.975	582.6
1.095	654.3	0.970	579.6
1.090	651.3	0.965	576.6
1.085	648.3	0.960	573.6
1.080	645.3	0.955	570.6
1.075	642.3	0.950	567.6
1.070	639.3	0.945	564.6
1.065	636.3	0.940	561.7
1.060	633.4	0.935	558.7
1.055	630.4	0.930	555.7
1.050	627.4	0.925	552.7
1.045	624.4	0.920	549.7
1.040	621.4	0.915	546.7
1.035	618.4	0.910	543.7
1.030	615.4	0.905	540.7
1.025	612.4	0.900	537.8
1.020	609.5		
The full scale blind setting is equal to a tank height of 600 inches minus the sensor height of 2.5 inches multiplied by the specific gravity of the asphalt.			

To change the full scale blind setting on the transmitter, you must use the magnetic push buttons on the transmitter **(Figure 5)**.

First use push button M to cause Mode 6 to show in the display window. Then use the other two push buttons to set the numerical value for the full scale blind setting.

Remember, the only configuration parameter that you can use to reset specific gravity is the full scale "blind setting" or Mode 6. *Do not change any other parameter!*

DISPLAY LEVELS VS. GALLONS

As already noted the transmitter displays levels in inches. You may need to know how many gallons of material that various levels represent.

Figure 5. Magnetic push buttons.

Some error is unavoidable when measuring levels and converting them to gallons of asphalt stored in the tank. Such determinations are not reliable substitutes for metering and calibration equipment.

It is important to note that pressure transmitters on Heatec tanks are now set up to display the height of the asphalt above the inside bottom of the tank. In the past the transmitters were set up to display the height of the asphalt above the location of the transmitter sensor.

You should not change the position of the transmitter or the location of its sensor. Doing that would cause all indications to be wrong.

The standard height for sensors of transmitters installed at Heatec is 11 inches above the bottom of the tank. (This distance may vary plus or minus 1/4-inch.) Consequently, the transmitter displays 11.00 inches when the asphalt level is at the same height as the sensor. And when the asphalt level is 11 inches there are approximately 647 gallons of material in the tank.

When transmitters are retrofitted in the field they are usually installed in the drain outlet. The height of the drain outlet is 2.5 inches. Consequently the transmitter displays 2.50 inches when the asphalt level is at the same height as the sensor. And when the asphalt level is 2.5 inches there are approximately 147 gallons of material in the tank.

But note that the transmitter does not actually indicate asphalt levels lower than the height of its sensor. So remember, any time the display of a transmitter installed at a height of 11 inches shows 11.00, the amount of asphalt in the tank is somewhere between 0 and 647 gallons. And any time the display of a transmitter installed at a height of 2.5 inches shows 2.50, the amount of asphalt in the tank is somewhere between 0 and 147 gallons.

Figure 6. Controller used to indicate levels.

The table shown in **Figure 9** enables you to convert levels to gallons. The column labeled "inches" refers to the numbers that are displayed on the transmitter **(Figure 3)** and on the level controller **(Figure 6)**.

FILLING THE TANK

The pressure transmitter works in conjunction with the controller **(Figure 6)** to automatically shut off the unloading pump when the material in the tank reaches a level approximately 24 inches from the inside top of the tank.

The tank is also equipped with a high level float switch. It functions as a backup system for the shutoff provided by the pressure transmitter. It will shut off the unloading pump at a level of approximately 7 inches from the inside top in case the pressure transmitter fails to shutoff the unloading pump.

INSTALLING A NEW TRANSMITTER

All new transmitters must be programmed at the Heatec factory using special Siemens software configured for Heatec tanks.

Only two settings can be reset in the field. One is the Full Scale Blind setting, which should be set according to the specific gravity of the material as explained earlier.

The other is the zero setting. This setting corrects for transmitter tilt. The transmitter is installed at Heatec with the display facing straight ahead with no tilt. If the transmitter is installed with the display facing up, the zero setting should be reset according to instructions in the Siemens manual under the heading **6.2.5 Zero Adjustment (Position Correction).** We do not recommend installing the transmitter with the display facing up.

VERIFYING ACCURACY OF LEVELS

You should periodically verify that the asphalt level indications produced by the pressure transmitter are acceptably accurate.

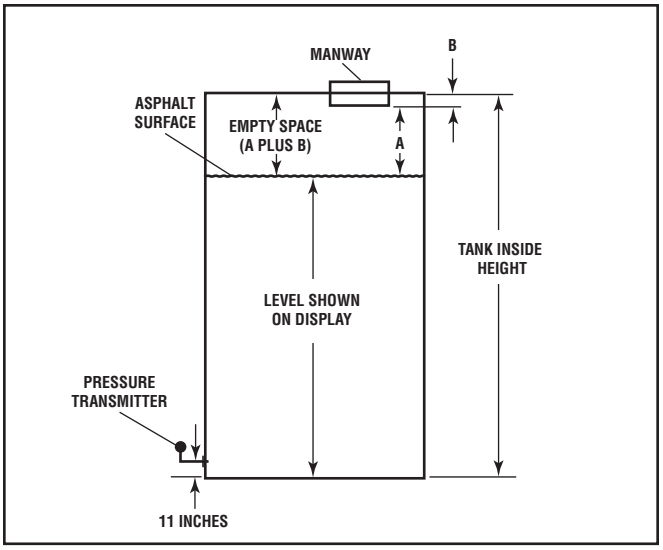

Figure 7. Key distances related to level display.

Figure 8. Inside height (inches) of vertical asphalt tanks.					
TAV-10	TAV-15	TAV-20	TAV-25	TAV-30	TAV-35
182.625	278.625	360.625	446.625	518.625	590.625

The easiest way to do this is to measure the empty space at the top of the tank using a measuring tape marked in inches. **(See Figure 7).**

Note: When making your measurement it is difficult to measure directly from the inside top surface of the tank to the asphalt surface. It is much easier to measure from the bottom edge of the manway to the surface of the asphalt. If you do that you will need to make a separate measurement to determine the distance from the edge of the manway to the topmost surface inside the tank. Then you should add the two measurements together as indicated in Figure 7.

Make this measurement while the tank is well over half full. Subtract your empty space measurement from the inside height of the tank shown in Figure 8.

Your final answer should match the number of inches displayed on the transmitter and controller, within one inch. If the indicated level differs much more than an inch try and find the cause.

Start by checking the full scale blind setting of the transmitter. Make sure it is properly set for the asphalt actually stored in the tank based on the specific gravity of the asphalt at its storage temperature. Use the information under the heading "resetting the transmitter" to determine the correct settings.

Be aware that debris or anything blocking the port where the transmitter connects to the tank will cause erroneous operation of the transmitter.

LAST RESORT

In the event that measured levels differ significantly from levels indicated by the transmitter it may be possible to use a *trial and error* method to bring the two into agreement. You might want to try this method especially when you are not sure about the specific gravity of the asphalt stored in the tank.

But before proceeding with the trial and error method, carefully recheck your taped measurements and your arithmetic for errors. And then check the full scale blind scale setting on the transmitter to make sure it is correct.

If the two levels still do not agree, proceed with the trial and error method. It involves nothing more than changing the values of the full scale blind setting on the transmitter.

Just arbitrarily increase or decrease the values until the displayed level indications agree with the level found with the measuring tape.

Each time you enter a new value and store it, check the transmitter to see how close it agrees with the level found using the measuring tape. Keep doing this until you get an acceptable match.

After using this method to attain agreement between the transmitter and measuring tape we recommend that you recheck one against the other several times over a period of a several days.

Figure 8. Asphalt volumes at various levels (Page 1 of 3 pages)									
INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
600.00	35,276	560.00	32,924	520.00	30,573	480.00	28,221	440.00	25,869
599.00	35,217	559.00	32,866	519.00	30,514	479.00	28,162	439.00	25,810
598.00	35,159	558.00	32,807	518.00	30,455	478.00	28,103	438.00	25,752
597.00	35,100	557.00	32,748	517.00	30,396	477.00	28,045	437.00	25,693
596.00	35,041	556.00	32,689	516.00	30,337	476.00	27,986	436.00	25,634
595.00	34,982	555.00	32,630	515.00	30,279	475.00	27,927	435.00	25,575
594.00	34,923	554.00	32,572	514.00	30,220	474.00	27,868	434.00	25,516
593.00	34,865	553.00	32,513	513.00	30,161	473.00	27,809	433.00	25,458
592.00	34,806	552.00	32,454	512.00	30,102	472.00	27,751	432.00	25,399
591.00	34,747	551.00	32,395	511.00	30,043	471.00	27,692	431.00	25,340
590.00	34,688	550.00	32,336	510.00	29,985	470.00	27,633	430.00	25,281
589.00	34,629	549.00	32,278	509.00	29,926	469.00	27,574	429.00	25,222
588.00	34,571	548.00	32,219	508.00	29,867	468.00	27,515	428.00	25,164
587.00	34,512	547.00	32,160	507.00	29,808	467.00	27,457	427.00	25,105
586.00	34,453	546.00	32,101	506.00	29,750	466.00	27,398	426.00	25,046
585.00	34,394	545.00	32,042	505.00	29,691	465.00	27,339	425.00	24,987
584.00	34,335	544.00	31,984	504.00	29,632	464.00	27,280	424.00	24,928
583.00	34,277	543.00	31,925	503.00	29,573	463.00	27,221	423.00	24,870
582.00	34,218	542.00	31,866	502.00	29,514	462.00	27,163	422.00	24,811
581.00	34,159	541.00	31,807	501.00	29,456	461.00	27,104	421.00	24,752
580.00	34,100	540.00	31,748	500.00	29,397	460.00	27,045	420.00	24,693
579.00	34,041	539.00	31,690	499.00	29,338	459.00	26,986	419.00	24,634
578.00	33,983	538.00	31,631	498.00	29,279	458.00	26,927	418.00	24,576
577.00	33,924	537.00	31,572	497.00	29,220	457.00	26,869	417.00	24,517
576.00	33,865	536.00	31,513	496.00	29,162	456.00	26,810	416.00	24,458
575.00	33,806	535.00	31,455	495.00	29,103	455.00	26,751	415.00	24,399
574.00	33,747	534.00	31,396	494.00	29,044	454.00	26,692	414.00	24,341
573.00	33,689	533.00	31,337	493.00	28,985	453.00	26,633	413.00	24,282
572.00	33,630	532.00	31,278	492.00	28,926	452.00	26,575	412.00	24,223
571.00	33,571	531.00	31,219	491.00	28,868	451.00	26,516	411.00	24,164
570.00	33,512	530.00	31,161	490.00	28,809	450.00	26,457	410.00	24,105
569.00	33,454	529.00	31,102	489.00	28,750	449.00	26,398	409.00	24,047
568.00	33,395	528.00	31,043	488.00	28,691	448.00	26,339	408.00	23,988
567.00	33,336	527.00	30,984	487.00	28,632	447.00	26,281	407.00	23,929
566.00	33,277	526.00	30,925	486.00	28,574	446.00	26,222	406.00	23,870
565.00	33,218	525.00	30,867	485.00	28,515	445.00	26,163	405.00	23,811
564.00	33,160	524.00	30,808	484.00	28,456	444.00	26,104	404.00	23,753
563.00	33,101	523.00	30,749	483.00	28,397	443.00	26,046	403.00	23,694
562.00	33,042	522.00	30,690	482.00	28,338	442.00	25,987	402.00	23,635
561.00	32,983	521.00	30,631	481.00	28,280	441.00	25,928	401.00	23,576

Figure 8. Asphalt volumes at various levels (Page 2 of 3 pages)									
INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
400.00	23,517	360.00	21,166	320.00	18,814	280.00	16,462	240.00	14,110
399.00	23,459	359.00	21,107	319.00	18,755	279.00	16,403	239.00	14,052
398.00	23,400	358.00	21,048	318.00	18,696	278.00	16,345	238.00	13,993
397.00	23,341	357.00	20,989	317.00	18,638	277.00	16,286	237.00	13,934
396.00	23,282	356.00	20,930	316.00	18,579	276.00	16,227	236.00	13,875
395.00	23,223	355.00	20,872	315.00	18,520	275.00	16,168	235.00	13,816
394.00	23,165	354.00	20,813	314.00	18,461	274.00	16,109	234.00	13,758
393.00	23,106	353.00	20,754	313.00	18,402	273.00	16,051	233.00	13,699
392.00	23,047	352.00	20,695	312.00	18,344	272.00	15,992	232.00	13,640
391.00	22,988	351.00	20,637	311.00	18,285	271.00	15,933	231.00	13,581
390.00	22,929	350.00	20,578	310.00	18,226	270.00	15,874	230.00	13,523
389.00	22,871	349.00	20,519	309.00	18,167	269.00	15,815	229.00	13,464
388.00	22,812	348.00	20,460	308.00	18,108	268.00	15,757	228.00	13,405
387.00	22,753	347.00	20,401	307.00	18,050	267.00	15,698	227.00	13,346
386.00	22,694	346.00	20,343	306.00	17,991	266.00	15,639	226.00	13,287
385.00	22,636	345.00	20,284	305.00	17,932	265.00	15,580	225.00	13,229
384.00	22,577	344.00	20,225	304.00	17,873	264.00	15,521	224.00	13,170
383.00	22,518	343.00	20,166	303.00	17,814	263.00	15,463	223.00	13,111
382.00	22,459	342.00	20,107	302.00	17,756	262.00	15,404	222.00	13,052
381.00	22,400	341.00	20,049	301.00	17,697	261.00	15,345	221.00	12,993
380.00	22,342	340.00	19,990	300.00	17,638	260.00	15,286	220.00	12,935
379.00	22,283	339.00	19,931	299.00	17,579	259.00	15,228	219.00	12,876
378.00	22,224	338.00	19,872	298.00	17,520	258.00	15,169	218.00	12,817
377.00	22,165	337.00	19,813	297.00	17,462	257.00	15,110	217.00	12,758
376.00	22,106	336.00	19,755	296.00	17,403	256.00	15,051	216.00	12,699
375.00	22,048	335.00	19,696	295.00	17,344	255.00	14,992	215.00	12,641
374.00	21,989	334.00	19,637	294.00	17,285	254.00	14,934	214.00	12,582
373.00	21,930	333.00	19,578	293.00	17,226	253.00	14,875	213.00	12,523
372.00	21,871	332.00	19,519	292.00	17,168	252.00	14,816	212.00	12,464
371.00	21,812	331.00	19,461	291.00	17,109	251.00	14,757	211.00	12,405
370.00	21,754	330.00	19,402	290.00	17,050	250.00	14,698	210.00	12,347
369.00	21,695	329.00	19,343	289.00	16,991	249.00	14,640	209.00	12,288
368.00	21,636	328.00	19,284	288.00	16,933	248.00	14,581	208.00	12,229
367.00	21,577	327.00	19,225	287.00	16,874	247.00	14,522	207.00	12,170
366.00	21,518	326.00	19,167	286.00	16,815	246.00	14,463	206.00	12,111
365.00	21,460	325.00	19,108	285.00	16,756	245.00	14,404	205.00	12,053
364.00	21,401	324.00	19,049	284.00	16,697	244.00	14,346	204.00	11,994
363.00	21,342	323.00	18,990	283.00	16,639	243.00	14,287	203.00	11,935
362.00	21,283	322.00	18,932	282.00	16,580	242.00	14,228	202.00	11,876
361.00	21,224	321.00	18,873	281.00	16,521	241.00	14,169	201.00	11,817

Figure 8. Asphalt volumes at various levels (Page 3 of 3 pages)									
INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS	INCHES	GALLONS
200.00	11,759	160.00	9,407	120.00	7,055	80.00	4,703	40.00	2,352
199.00	11,700	159.00	9,348	119.00	6,996	79.00	4,645	39.00	2,293
198.00	11,641	158.00	9,289	118.00	6,938	78.00	4,586	38.00	2,234
197.00	11,582	157.00	9,231	117.00	6,879	77.00	4,527	37.00	2,175
196.00	11,524	156.00	9,172	116.00	6,820	76.00	4,468	36.00	2,117
195.00	11,465	155.00	9,113	115.00	6,761	75.00	4,410	35.00	2,058
194.00	11,406	154.00	9,054	114.00	6,702	74.00	4,351	34.00	1,999
193.00	11,347	153.00	8,995	113.00	6,644	73.00	4,292	33.00	1,940
192.00	11,288	152.00	8,937	112.00	6,585	72.00	4,233	32.00	1,881
191.00	11,230	151.00	8,878	111.00	6,526	71.00	4,174	31.00	1,823
190.00	11,171	150.00	8,819	110.00	6,467	70.00	4,116	30.00	1,764
189.00	11,112	149.00	8,760	109.00	6,408	69.00	4,057	29.00	1,705
188.00	11,053	148.00	8,701	108.00	6,350	68.00	3,998	28.00	1,646
187.00	10,994	147.00	8,643	107.00	6,291	67.00	3,939	27.00	1,587
186.00	10,936	146.00	8,584	106.00	6,232	66.00	3,880	26.00	1,529
185.00	10,877	145.00	8,525	105.00	6,173	65.00	3,822	25.00	1,470
184.00	10,818	144.00	8,466	104.00	6,115	64.00	3,763	24.00	1,411
183.00	10,759	143.00	8,407	103.00	6,056	63.00	3,704	23.00	1,352
182.00	10,700	142.00	8,349	102.00	5,997	62.00	3,645	22.00	1,293
181.00	10,642	141.00	8,290	101.00	5,938	61.00	3,586	21.00	1,235
180.00	10,583	140.00	8,231	100.00	5,879	60.00	3,528	20.00	1,176
179.00	10,524	139.00	8,172	99.00	5,821	59.00	3,469	19.00	1,117
178.00	10,465	138.00	8,114	98.00	5,762	58.00	3,410	18.00	1,058
177.00	10,406	137.00	8,055	97.00	5,703	57.00	3,351	17.00	999
176.00	10,348	136.00	7,996	96.00	5,644	56.00	3,292	16.00	941
175.00	10,289	135.00	7,937	95.00	5,585	55.00	3,234	15.00	882
174.00	10,230	134.00	7,878	94.00	5,527	54.00	3,175	14.00	823
173.00	10,171	133.00	7,820	93.00	5,468	53.00	3,116	13.00	764
172.00	10,112	132.00	7,761	92.00	5,409	52.00	3,057	12.00	706
171.00	10,054	131.00	7,702	91.00	5,350	51.00	2,998	11.00	647
170.00	9,995	130.00	7,643	90.00	5,291	50.00	2,940	10.00	588
169.00	9,936	129.00	7,584	89.00	5,233	49.00	2,881	9.00	529
168.00	9,877	128.00	7,526	88.00	5,174	48.00	2,822	8.00	470
167.00	9,819	127.00	7,467	87.00	5,115	47.00	2,763	7.00	412
166.00	9,760	126.00	7,408	86.00	5,056	46.00	2,705	6.00	353
165.00	9,701	125.00	7,349	85.00	4,997	45.00	2,646	5.00	294
164.00	9,642	124.00	7,290	84.00	4,939	44.00	2,587	4.00	235
163.00	9,583	123.00	7,232	83.00	4,880	43.00	2,528	3.00	176
162.00	9,525	122.00	7,173	82.00	4,821	42.00	2,469	2.00	118
161.00	9,466	121.00	7,114	81.00	4,762	41.00	2,411	1.00	59