

UFM

ULTRASONIC FLOW METER

Operation Manual

UFM- DT - JS - 1035 - 2019
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Preface

Thank you for choosing the products of Dandong Top Electronics Instrument (Group)Co.,Ltd.

This operation manual provides you with important information on installation, connection and commissioning as well as on maintenance, troubleshooting and storage. Please read it carefully before installation and commissioning and keep it as part of the product near the meter for easy reading.

This manual can be downloaded by entering the version number at www.ddtop.com .

If the instructions are not followed, the protection provided by the meter may be destroyed.

Trademark, Copyright and Restriction Instructions

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The performance specifications of the meter are effective as of the date of publication and are subject to change without notice. Dandong Top Electronics Instrument (Group)Co.,Ltd. reserves the right to modify the products described in this manual at any time without prior notice.

Quality Assurance

Dandong Top Electronics Instrument (Group) Co.,Ltd. guarantees that all glass plate level gauge have no defects in materials and manufacturing processes within one year from the date of delivery.

During the warranty period, if the product returns with quality problems and the claim is determined by the manufacturer to be within the scope of warranty, Dandong Top Electronics Instrument (Group) Co.,Ltd. is responsible for repair or replacement of the buyer (or owner) free of charge.

Dandong Top Electronics Instrument (Group) Co.,Ltd. is not responsible for the costs caused by improper use of equipment, labor claims, direct or subsequent damage and installation and use of equipment. In addition to the special written warranty certificate for certain products of Dandong Top Electronics Instrument (Group) Co.,Ltd., Dandong Top Electronics Instrument (Group) Co.,Ltd. does not provide any express or implied warranty.

Quality

Dandong Top Electronics Instrument (Group) Co.,Ltd. has passed the ISO9001 quality system certification. The whole process of product production is strictly in accordance with the scope of the quality system, providing the strongest guarantee for product and service quality.

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1 Safety Tips

It is expressly prohibited to modify or change products for safety reasons, repair or replacement only allows the use of accessories specified by the manufacturer.

1.1 Explosion may result in death or serious injury.

When installing equipment in an explosive atmosphere, be sure to follow applicable local, national, international standards, codes, and procedures. Be sure to install the equipment in Intrinsically safe or non-flammable site operating procedures.

1.2 Process leaks can cause serious injury or death.

Care should be taken to lift the transmitter. If the process seal is damaged, the medium may leak at the joint.

1.3 Failure to follow safe installation guidelines may result in death or serious injury.

The operations described in this manual are performed by professionally trained and qualified professionals or end-user specialized professionals to complete.

2 Product Description

2.1 Main Structure of the Product - Figure 1

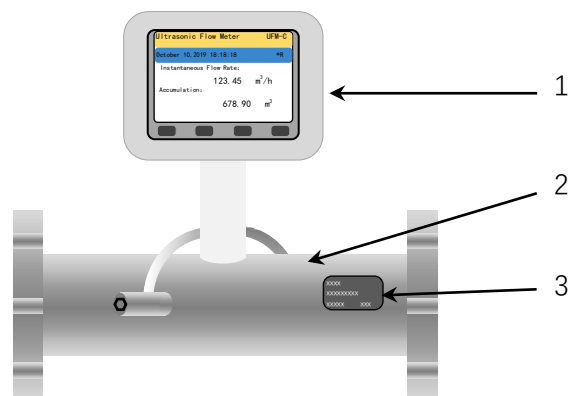


Figure 1 Main Structure of the Product

1. Host
2. Straight Pipe
3. Straight Pipe Section Nameplate

2.2 Operating Principle

Ultrasonic signal propagation in the fluid, the propagation speed will be affected by the medium flow rate, resulting in downstream and counter-current propagation time is different, in the same propagation distance, there will be propagation time difference, and then introduce other parameters, after further calculations can be obtained flow. Ultrasonic flow meter provides 4 ~ 20mA current output, LCD screen can display the current instantaneous flow, accumulation and other information.

2.3 Warehousing

Storage temperature -20°C~+60°C, relative humidity not more than 85% in a non-corrosive ventilated room.

3 Main Parameters

1. Instrument diameter: DN50-DN1000 (can be customized)
2. Flow rate range: 0~±10m/s
3. Fluid temperature: -30°C~160°C
4. Pipe material: steel, stainless steel, cast iron, copper, PVC, aluminum, glass fiber reinforced plastic and all other quality tight piping.
5. Accuracy: $\leq \pm 1\%$
6. Repeatability: $\leq \pm 0.2\%$
7. Power consumption: $\leq 3W$
8. Types of fluids: water, seawater, sewage, acids and alkalis, alcohol, etc., which are single media capable of conducting ultrasound.

4 Unpacking and Inspection

4.1 Precautions for Unpacking Inspection

4.1.1 Check whether the product nameplate is consistent with the supply list information.

4.1.2 Check the completeness of the accessories against the supply list.

4.2 Content of Inspection

4.2.1 Check the appearance of the instrument for defects, damage and other abnormalities.

4.2.2 Checking for damage, fracture and other abnormalities in the straight pipe section.

4.2.3 Checking for abnormalities such as untightened sensor cover plate connections.

5 Screen and Operation

5.1 Main Screen

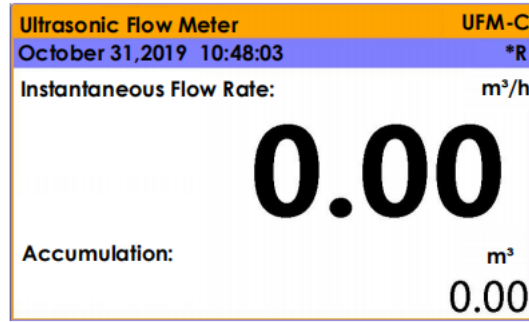


Figure 2 Main Screen Display

Description:

1. Ultrasonic flowmeter name and model number at top. 2.
2. The left side of the blue background is the current time, and the right side is the current working status of the flow meter (see the following).
3. The top half of the display area is the current instantaneous flow value (the number of decimal places can be set in the menu as required).
4. The bottom half is the cumulative amount (which can be zeroed out in the menu).

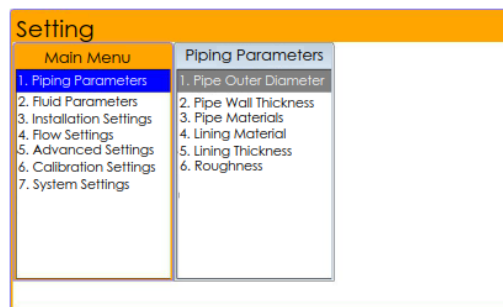



Figure 3 Menu Screen


5.2 Menu Screen

Description:

1. The primary menu is on the far left and its sub-menus (secondary menus) are on the right of the primary menu.
2. The currently selected menu window is orange background box, the currently selected menu item is blue background.

5.3 Keyboard and Operation

The keyboard as shown in Figure 4, from left to right for the left, up, down and right four optical keys, of which the left and right (i.e. two keys on both sides) pressed at the same time for the Enter (ENT / ) key, up and down (i.e. two keys in the middle) pressed at the same time for the return (ESC) key.

How to enter the menu: In the main interface, press Enter (ENT/ ) , that is, both buttons pressed at the same time) to enter the menu (settings) interface; press the return key (ESC, that is, the middle of the two buttons) will return up to the first level of the menu, and finally return to the main

interface (traffic display interface).

In the menu (settings) screen, the top and bottom are used to select menu items, and the left and right are used to select editable numeric digits.

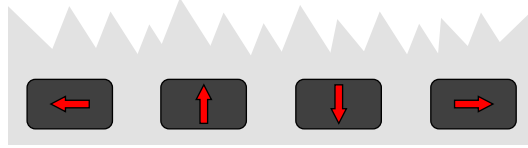






Figure 4: Keyboard Layout

6 Parameter Settings

6.1 Parameter Settings

In the main interface (Figure 2), press the Enter key (ENT/ ) to enter the settings (menu) interface (Figure 3).

1) Select "Pipeline Parameters", and then press  to enter the secondary menu, select "Pipeline OD", and then press  to enter the OD edit interface (Figure 5), type in the pipe OD value, and then press  to save the OD value, the system will automatically return to the previous menu.

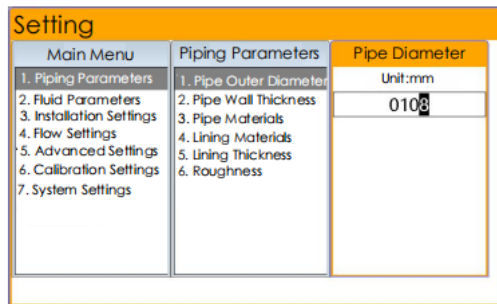





Figure 5 Outer Diameter Edit Box

2) Press  to select "Pipe Wall Thickness", press  to enter the wall thickness edit box, type the wall thickness value, press  to save and return to the previous menu.

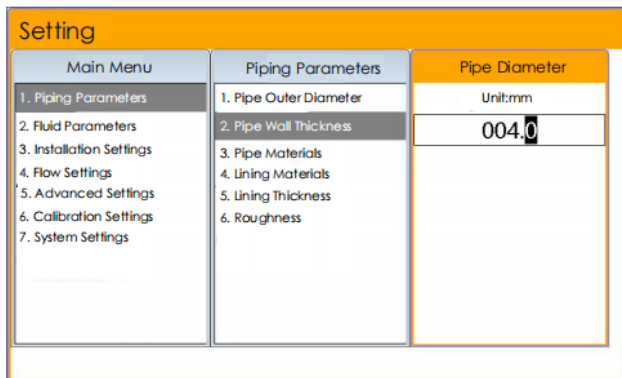






Figure 6 Wall Thickness Edit Box

3) Press  to select "pipe material", the default is carbon steel, press  to enter the pipe material selection box, and then select the corresponding pipe material, press  to save and return to the upper menu (Figure 7). If there is no current pipe material in the pipe material selection column, then select other, press  to enter the pipe material speed input window (Figure 8), enter the speed of sound of the current pipe material, press Enter to save and return to the menu bar.

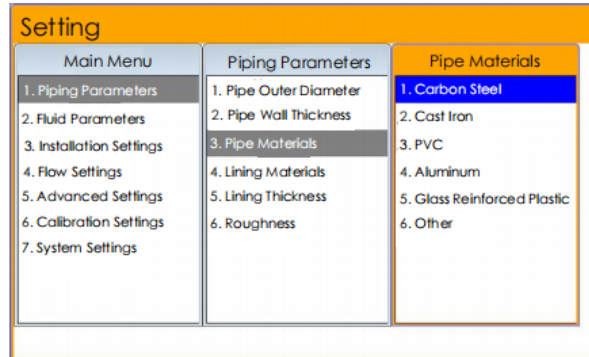


Figure 7 Pipe Material Selection

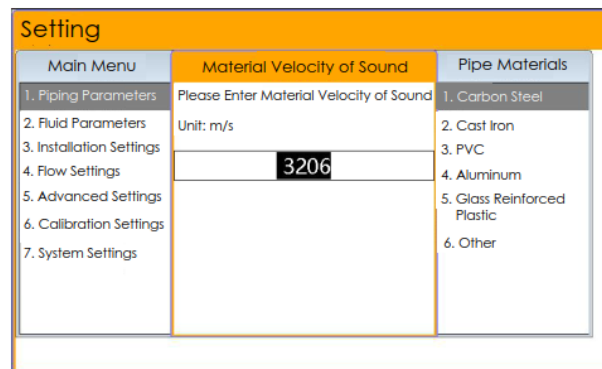





Figure 8 Other Material Speed of Sound Edit Box

4) Press  to select "lining material", the default is none, press  to enter the lining material selection box, select the corresponding lining material, press  to save and return to the upper level menu (Figure 9). If the lining material selection column does not have the current lining material, then select other, press to enter the lining material speed of sound input window, enter the speed of sound of the current lining material, then press enter to save and return to the menu bar.

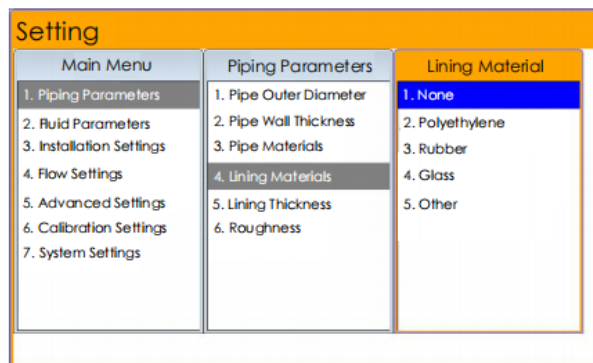





Figure 9 Pipe Lining Selection Frame

5) Press  to select "lining thickness", press  to enter the lining thickness edit box, if there is no lining material, enter 0, press to  save and return to the upper level menu, if there is a lining

can enter the corresponding lining thickness.

6) Press  to select "Roughness", and then press  to enter the Roughness edit box, enter the pipe roughness, and then press  to save and return to the menu bar (Figure 10).

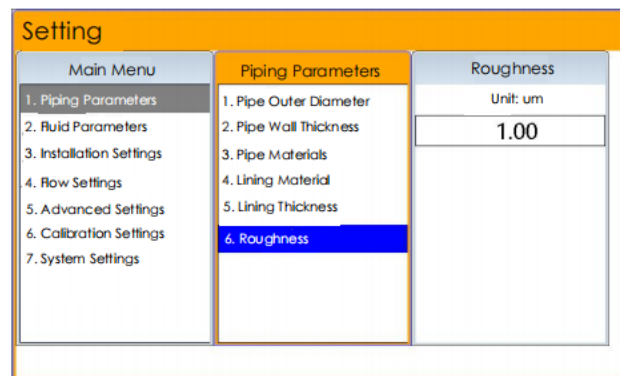




Figure 10 Pipe Roughness Setting

7) Press ESC to return to the primary menu, and then select "Fluid Parameters", press  to enter the secondary menu, select "Fluid Type", enter the tertiary menu to select the fluid type, enter the fluid "kinematic viscosity", "density", "temperature" and other parameters.

8) Press ESC to return to the first level menu, select "installation settings", set the "probe type" and "installation", and then press  to select "installation information", you can view the installation information in the three-level menu location (Figure 11), the information bar displays the current settings of the parameters of the flowmeter and the probe installation distance (installation distance for the distance of the probe housing, Figure 11).

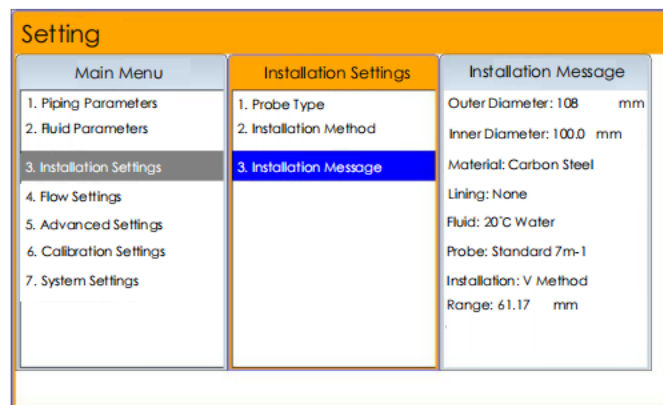


Figure 11 Installation Information View

6.2 Display Settings

Enter the first level menu "4. Flow Rate Setting", you can set the resolution and multiplication factor of instantaneous flow rate, the resolution and multiplication factor of accumulation rate, and the display mode of accumulation rate as shown in Figure 12.

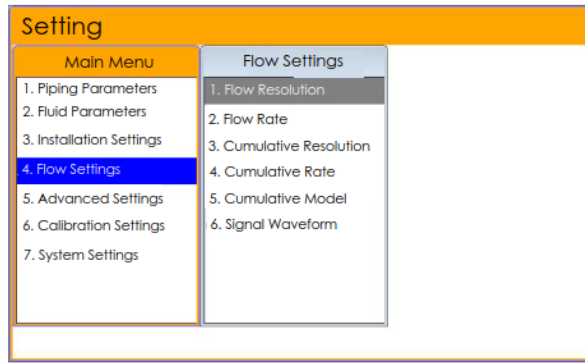


Figure 12 Main Screen Display Related Settings

7 Debugging

7.1 Single Point Calibration

In the menu screen, select "6. Calibration Settings" and enter the lower level menu, select "2. standard values", as shown in Figure 19.

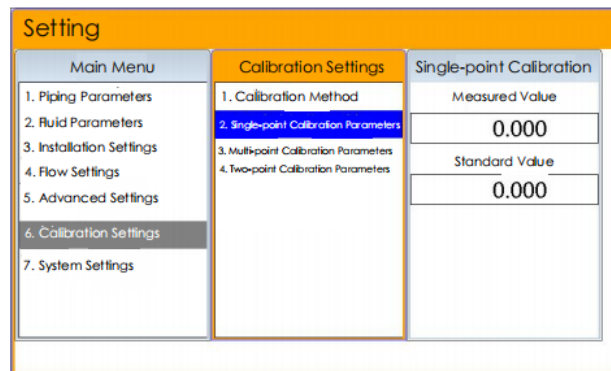


Figure 19 Single-point Calibration Input Interface

Note: Measured value: the current flow value displayed on the main screen.

Standard value: The actual flow value in the current pipeline.

7.2 Two-point and Multi-point Calibration

If "Two-point Calibration" and "Multi-point Calibration" are to be used, the current flow rate in the pipe must be adjustable and can be adjusted between a minimum flow rate (around 10 m³/h) and a maximum flow rate (the maximum flow rate in the current pipe). If the conditions allow, you can choose "Two-point Calibration" and "Multi-point Calibration" to make the flowmeter measurement more accurate. The parameters of "Two-point Calibration" and "Multi-point calibration" can be entered in the same way as "Single-point Calibration", i.e. press the down arrow to select the corresponding mode, and then enter the corresponding position in the lower level menu. Two or more sets of measurements and standard values.

7.3 Calibration Method

After entering the calibration parameters, select "1. Calibration method ", enter the lower menu, select the corresponding calibration method. Note that if the selected calibration method does not have a corresponding parameter (measured value vs. standard value), a message will be displayed and "None" will be selected by default. This is shown in Figure 20.

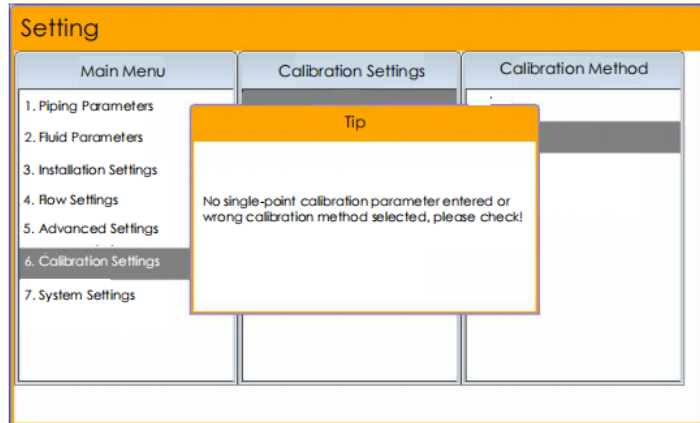


Figure 20 Information Prompt Window



After confirming the calibration method, return to the main screen for normal measurement.

8 System Settings

8.1 Language

Select "7. System Settings "in the main menu and "1. Language" in the lower menu. After entering, select the corresponding language in the lower menu, then press enter to set the system language.

8.2 Date and Time

The "2. Date and Time" under system settings can calibrate the system time, just enter it directly. For example: set the current time to January 1, 2018, 13:23:14, that is, in the date input box: 180101, press  to enter the time input box, enter 132314, press  to save and return to the upper menu can be.

8.3 Restore Factory Setting

If you do not know whether the current flow meter parameters are set correctly, or if you need to reset the parameters, you can first restore the flow meter to the default parameters set at the factory, and then reset the parameters according to the contents of Chapter 3, and install the flow meter.

8.4 Factory Setting

This menu item is a design-developer specific menu and cannot be set by the user.

9 Frequently Asked Questions

9.1 How to Identify Fluid Flow in a Pipeline

When the sensor is properly installed and wired, a positive instantaneous flow rate indicates that the fluid is flowing in a positive direction, i.e., from the upstream probe to the downstream probe. If the instantaneous flow rate shows a negative value, it means that the flow is in the opposite direction.

9.2 How to Set up a Zero Cut to Avoid Invalid Accumulation

Select "5. Advanced Settings" in the main menu, then select "3.Cut-off Flow Rate" in the lower menu. The system will treat the flow rate below this value as "0" to avoid false accumulation of measurement error generated by the flowmeter when the real flow rate is "0". In general, the secondary parameter is set at 0.03m/s. When the flow rate is greater than the cut-off flow rate, the measurement result has nothing to do with the cut-off flow rate and will not affect the measurement result.

9.3 How to Set 4~20mA Output

Select "5. Advanced Settings " in the main menu,and enter to select "1. Lower Flow Limit", enter the lower flow rate limit value in the corresponding window, which indicates the flow rate value at 4mA; select "2. Upper Flow Limit", enter the upper flow rate limit value in the corresponding window, which indicates the flow rate value at 20mA.

To calibrate, unplug the probe cable, then go to "5. Advanced Settings" and select "8.4~20mA Settings", enter the appropriate value in the lower level menu to make the output 4mA to complete the calibration.

Appendix Common Parameters

Table 1 Velocity and Viscosity of Common Liquids

Liquid	Velocity(m/s)	Viscosity
Water 20°C	1482	1.0
Water 50°C	1543	0.55
Water 75°C	1554	0.39
Water 100°C	1543	0.29
Water 125°C	1511	0.25
Water 150°C	1466	0.21
Water 175°C	1401	0.18

Liquid	Velocity(m/s)	Viscosity
Glycerine	1923	1180
Petrol	1250	0.80
66#Petrol	1171	—
80#Petrol	1139	—
0#Diesel Fuel	1385	—
Benzene	1330	—
Ethylbenzene	1340	—

Water 200°C	1333	0.15
Water 225°C	1249	0.14
Water 250°C	1156	0.12
Acetone	1190	0.407
Methanol	1121	—
Ethanol	1168	—
Alcohol	1440	1.5
Ketone	1310	—
Acetaldehyde	1180	—
Ethylene Glycol	1620	21.112
Aniline	1659	1.762
n-Octane	1192	—
Trichloromethane	1001	0.383
Glycerine	1923	1188.5
Methyl Acetate	1181	0.411
Dicarboxylic Acid	1389	—
Quicksilver	1451	0.114
Carbon Disulfide	1158	0.290
n-Propanol	1225	—
n-Ethane	1083	0.489
Transformer Oil	1425	—
Petroleum	1295	—

Toluene	1170	0.69
Carbon Tetrachloride	938	0.608
Gasoline	1420	2.3
Petroleum	1290	—
Turpentine	1280	—
Trichloroethylene	1050	0.82
Dagang Navigation Coal	1298	—
Daqing 0# aviation coal	1290	—
Peanut Oil	1472	—
Castor Oil	1502	—
Ether	1006	0.336
o-Xylene	1360	—
Chlorobenzene	1289	—
Acetic Acid	1159	1.162
Ethyl Acetate	1164	—
Heavy Water	1388	1.129
Nitrobenzene	1473	1.665
Tribromomethane	931	—
n-Pentane	1032	0.366
light Oil	1324	—
Spindle Lubrication	1342	15.7
Petrol	1250	0.4-0.5

Table 2 Velocity of Common Materials

Tube Material	Velocity (m/s)
Steel	3206
Iron	3230
Cast Iron	2460
Lead	2170
ABS	2286
Aluminum	3048
Brass	2270
Cast Iron	2460
Bronze	2270
Glass-reinforced Plastic	3430
Glass	3276
Polyethylene	1950
Propenyl	2644
PVC	2540
Mortar	2500

Lining Material	Velocity (m/s)
Teflon	1225
Ductile Iron	3000
Stainless Steel	3206
Chloroethylene	2640
Titanium	3150
Cement	4190
Pitch	2540
Enamel	2540
Glass	5970
Plastic	2280
Polyethylene	1600
Polytetrafluoroethylene	1450
FRP	2505
Rubber	1600
Asphalt Epoxy	2505

Table 3: Velocity Table in Water

T/°C	V(m/s)	t/°C	V(m/s)	t/°C	V(m/s)	t/°C	V(m/s)	t/°C	V(m/s)	t/°C	V(m/s)
0	1402.3	18	1476.0	37	1523.5	55	1547.3	73	1555.0	91	1549.8
1	1407.3	19	1479.1	38	1525.3	56	1548.1	74	1555.1	92	1549.2
2	1412.2	20	1482.3	39	1527.1	57	1548.9	75	1555.1	93	1548.5
3	1416.9	21	1485.3	40	1528.8	58	1549.6	76	1555.0	94	1547.5
4	1421.6	23	1491.1	41	1530.4	59	1550.3	77	1554.9	95	1547.1
5	1426.1	24	1493.9	42	1532.0	60	1550.9	78	1554.8	96	1546.3
6	1430.5	25	1496.6	43	1533.5	61	1551.5	79	1554.6	97	1545.6

7	1434.8	26	1499.2	44	1534.9	62	1552.0	80	1554.4	98	1544.7
8	1439.1	27	1501.8	45	1536.3	63	1552.5	81	1554.2	99	1543.9
9	1443.2	28	1504.3	46	1537.7	64	1553.0	82	1553.9		
10	1447.2	29	1506.7	47	1538.9	65	1553.4	83	1553.6		
11	1451.1	30	1509.0	48	1540.2	66	1553.7	84	1553.2		
12	1454.9	31	1511.3	49	1541.3	67	1554.0	85	1552.8		
13	1458.7	32	1513.5	50	1542.5	68	1554.3	86	1552.4		
14	1462.3	33	1515.7	51	1543.5	69	1554.5	87	1552.0		
15	1465.8	34	1517.7	52	1544.6	70	1554.7	88	1551.5		
16	1469.3	35	1519.7	53	1545.5	71	1554.9	89	1551.0		
17	1472.7	36	1521.7	54	1546.4	72	1555.0	90	1550.4		