



Electronic Commissioning Unit

Instructions

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1. The Comdronic™ Unit

The Comdronic™ AC6 electronic commissioning unit has been developed in response to demand from discerning commissioning engineers requiring an improvement in measuring techniques for differential pressures in heating and air conditioning systems.

The Comdronic™ AC6 unit utilises state of the art technologies in the field of electronics, software and hydraulic protection for the sensitive measuring element.

The use of the latest wet/wet sensor technology has opened up possibilities for extremely accurate measurement of differential pressures, however, the delicate nature of this type of sensor design means that damage can easily occur if the correct operating procedure is not followed. To overcome this threat to the sensor the Comdronic™ AC6 unit has a unique protected crossover valve arrangement (DSP Technology™) designed to protect the sensor in the event of damaging high differential pressures being present.

2. Health and Safety

Comdronic™ takes every reasonable precaution to ensure that AC6 commissioning units are designed, constructed, calibrated and tested for safe and trouble free operation when used in accordance with the operating instructions.

For safe operation it is important that commissioning engineers read and understand the instructions contained in this manual. It is also very important that those employed in the function of commissioning are aware of the general hazards associated with the systems being commissioned.

When working with the AC6 it is the users responsibility to ensure that any Personal Protective Equipment (PPE) or clothing is worn as appropriate to the hazards potentially present.

It is also the user's responsibility to understand the Health and Safety issues relating to water systems that contain water at high pressures, water containing flushing agents, cleaning agents, antifreeze agents and water that might be at elevated temperatures. This list is however, not exhaustive.

Please note: Whilst every effort is made to ensure that valve data is correct Comdronic Ltd cannot be held responsible for modifications, updates and new product additions. Valve manufacturers invariably reserve the right to modify product, as such, delays in updating the Comdronic™ software may result. The user is advised to check performance data (Kvs values) of specific valves prior to use. Contact us for valve updates.

3. Description of Unit

The Comdronic™ AC6 Unit comprises the following:

- Hand held transducer and display unit enclosed in rubber protection sleeve.
- Quick connect tubing set complete with manually operated isolation valves
- A variety of adapters to connect to the majority of currently manufactured balancing valves.
- Toolkit
- Lanyard for attachment of the unit to pipework etc.
- Spare battery
- Instruction manual
- Quick start instruction set and menu map
- All above incorporated in a lightweight carrycase.

4. Connection and Set-up Procedure

For immediate operation of the unit refer to the 'quick start' guide.

Press any button to switch the unit on.

Use the X button for cancelling entries or returning to previous screens. The X button also allows the unit to be switched off.

Use the menu to show the display options.

Press help button (?) at any time for context sensitive help files. Use up and down buttons to scroll help file.

System Defaults

The AC6 unit has been set up with default values for all the editable functions and are listed as follows:

Language = English
Pressure = kPa
Flow = l/s
Design flow = 0 l/s
Target flow = 0%
Flow alerts = off
Light timer = 5 minutes
Auto off timer = 5 minutes
Update time = 1 second
Sample time = 3 seconds
Specific gravity = 1.00

The above default settings are satisfactory to use immediately. Please read all instructions to establish the effects of editing the above values.

Automatic alerts

In addition to the menu options which can be selected by the user there are a series of automatic functions which will be displayed on the message bar at the top of the screen. These include:

Zero sensor
Low battery
Change battery
Specific gravity (displays when not set to 1.0sg)
Temperature warning (When internal temperature is high)

Connection

- Select the correct connection adaptors for the device being measured.
- Attach adaptors to the connection tubes before attachment to the valve or measuring device.

Each connection tube is fitted with an isolating valve which can be arranged so that the valves are adjacent to either the AC6 unit or the subject measuring device. The choice is a matter of personal preference and/or site conditions. **ENSURE THESE ARE IN CLOSED POSITION WHEN CONNECTING TUBES TO SYSTEM.**

- 1 Attach the red plastic connection tube to the high pressure test point on the subject measuring valve or device.
- 2 Attach the blue plastic connection tube to the low pressure test point on the subject measuring device.
- 3 Ensure both isolating valves on the connection tubes are in the **CLOSED** position.
- 4 Attach AC6 Unit to the free end of the red and blue connection tubes and ensure that the equalising valve is **OPEN** (turn anti-clockwise).

- 5 Open isolating valves on red and blue connection tubes. The differential pressure across the subject measuring device will generate flow through the connection tubes from high pressure side to low pressure side thus expelling air.
- 6 Close isolating valves on both red and blue connection tubes.
- 7 Press the zero button to set datum at zero.
- 8 Open isolating valves on both red and blue connection tubes.
- 9 Close the equalising valve
- 10 Unit will now read differential pressure.

Notes:

- 1 When extremes of temperature change are apparent ie when used on hot system or if the instrument is transferred from warm environment to cold environment it may be necessary to zero the AC6 unit after a period of time has elapsed and the unit has stabilised).
- 2 The AC6 unit has an inbuilt timer to switch the unit off after the period set by the timer function, If a button is pressed during the timing period the timer is reset to zero and will keep the unit on for a further period of time.
- 3 Before removing tubes open the equalising valve. This is good practice when transferring from one balancing valve to the next.

IMPORTANT SAFETY NOTE:

Removal or attachment of a single connection tube when isolating valves are open can result in automatic operation of the DSP Technology™ sensor protection system and water will be ejected from the unconnected port. This mechanism is designed to protect the sensitive measuring sensor. (Standard unit only)

For removal of AC6 unit ensure that equalising valve is OPEN before CLOSING isolating valves on connection tubes. The AC6 unit and the connecting tubes can now be removed safely from subject measuring valve or device.

For full functionality refer to menu system and features below.

5. Menu system

The AC6 has been designed with 5 menus for ease of use. Within each menu there are a series of functions which can be easily accessed and edited using the up, down, left and right keys.

Supplied with your AC6 is a 'Quick start guide' which shows the layout of each menu.

Main Menu	Display Menu	Units Menu	Advanced Menu	Damping Menu
Select Valve	Flow/ Pressure	Pressure	Flow alerts	Update time
Valve Position	Multi display	Flow	Back Light timer	Sample time
Design Flow	Pressure		Auto off timer	
Target Flow	Flow		View size as	
Pipe size	About			
User Kvs				

Press menu button twice for language options. Language options apply to menus and help screens only.

The menu system is accessed using a single press of the menu button. Each menu can then be selected by using left or right arrow keys ◀▶ When the correct menu is shown on the screen use the up and down arrow keys ▲▼ to select the correct function which is then accepted using the tick button. ✓

Menu functions that require a numeric value to be added use a system which is best described using the following example:

Example- Setting the design flow to 1.05 l/s.

Menu selects the menu option,

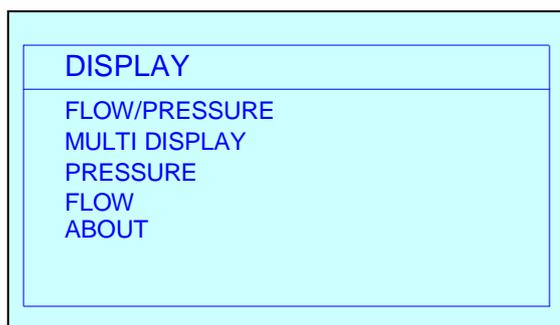
- ◀ selects the **MAIN** menu
- ▼, ▼ moves the cursor down to the design flow option.
- ✓ accepts the design flow option
- ▲ will change the value of the first column to 1
- ▶ selects the next column
- ▼ selects a decimal point
- ▶ Selects the next column
- ▶ Selects the next column
- ▲,▲,▲,▲,▲, changes the digit to 5
- ✓ Accepts the selected value of 1.05
- X Returns to the main **DISPLAY**

To enter a negative number use the ZERO key before any number is added.

To enter a decimal point, use the down arrow when the zero digit is showing. (See example above)

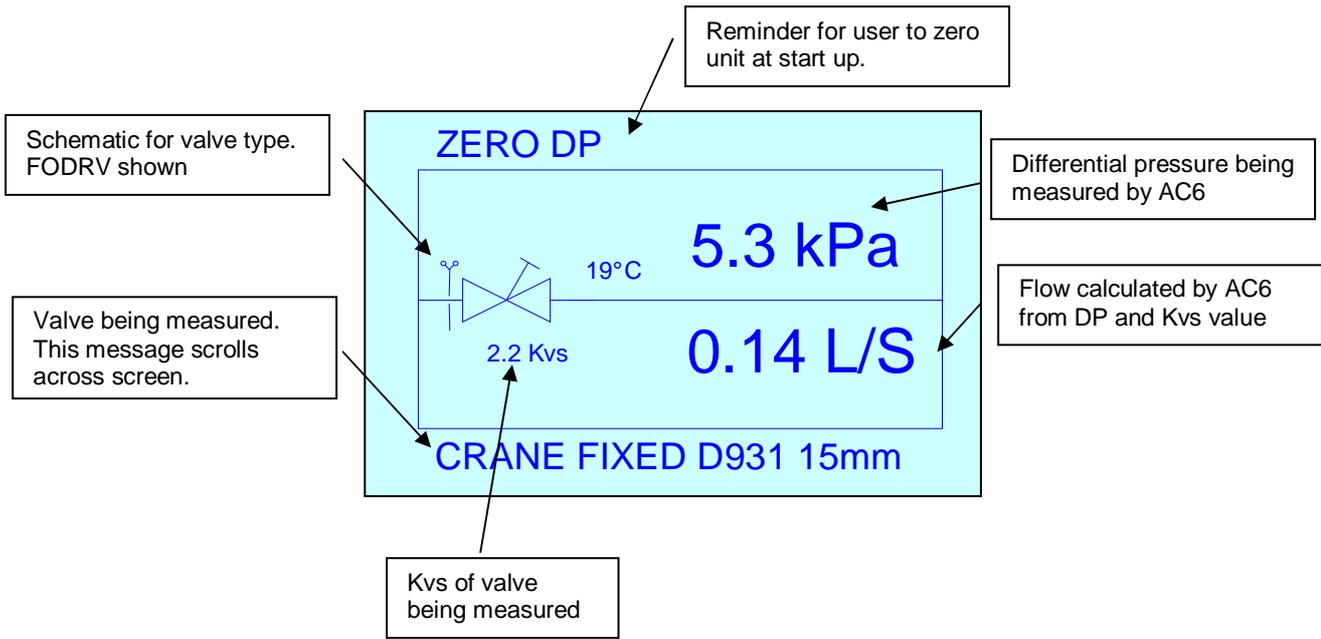
6. Display Options

The Display menu has four functions-



Flow/Pressure display

The Flow/Pressure display is the default display for the AC6 and is designed for most general commissioning purposes.

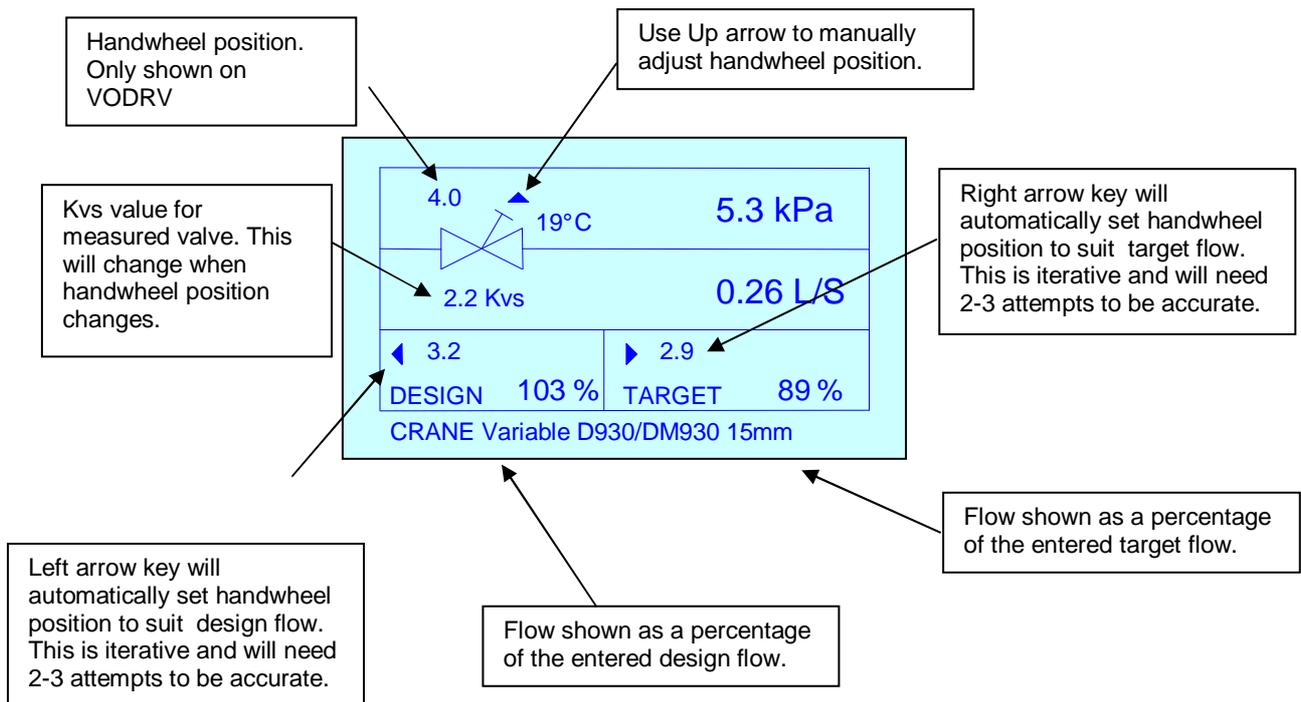


The flow and dp are displayed in large text for ease of use. The schematic valve and valve description are also maintained. The type of valve selected (Fixed or variable) is shown as a schematic symbol with handwheel and kvs data in accordance with the selected valve. The differential pressure and flow are displayed and continuously updated according to the signals received from the valve being measured.

Multi Display

For commissioning engineers wishing to carry out commissioning using design and target flow the Multi display can be selected.

The Multi display is the most appropriate when variable orifice valves are used.



Design flow and target flow are displayed. If the values for these parameters are set to zero then a series of dashes are displayed.

When variable orifice balancing valves are selected and a design and target flow have been entered the Comdronic™ AC6 unit automatically uses the predictive handwheel position and displays this above the design or target flow in their respective boxes on the display. When the valve has been adjusted to the predicted position use the left or right arrow navigation button to adjust the handwheel setting. Note: The design flow and the target flow could be different values so it is important to use the correct navigation button.

The predictive process is iterative due to the unknown valve authority in the circuit so it will be necessary to use this feature more than once.

The measuring valve selected is described in the scrolling bar at the base of the screen.

Pressure display

The Differential pressure is displayed in large text. This screen is useful for users wishing to use the AC6 unit as a simple manometer.



Flow display

The flow of water is displayed in large text. This screen is useful for users wishing to use the AC6 unit as a simple Flowmeter



About

The about screen gives the brand and the serial number of the unit.



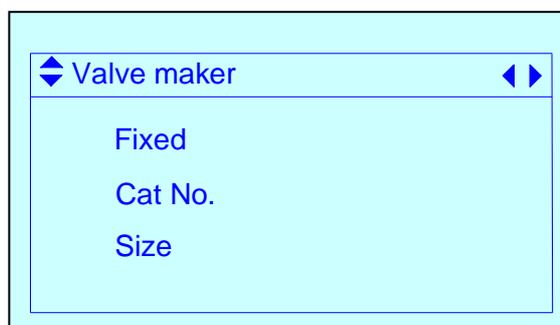
'Main' menu

Within the MAIN menu there are 7 functions



Select valve

The database of valves and measuring devices can be accessed using the navigation buttons.



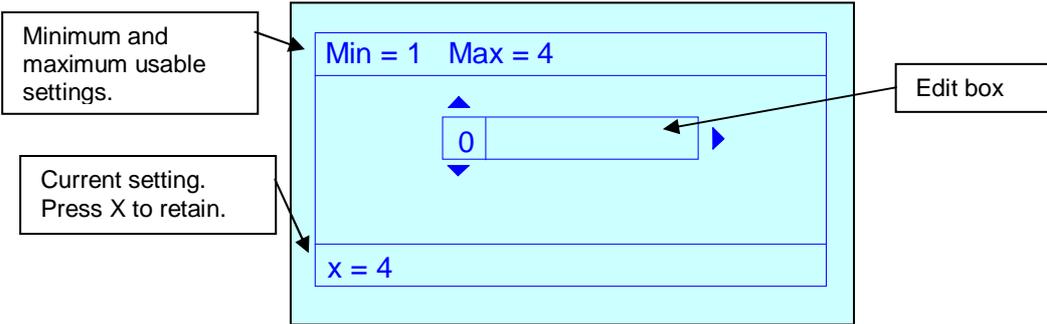
Important: Select all items on screen before using tick button to accept.

To select the manufacturer use the right or left navigation keys.
To select the type of valve, cat no. and size use the up and down navigation buttons followed by left and right keys for individual selections.

With the correct manufacturer, valve type, valve cat no. and size use the tick button to select.

Valve position

This must be entered when variable orifice valves are being measured.



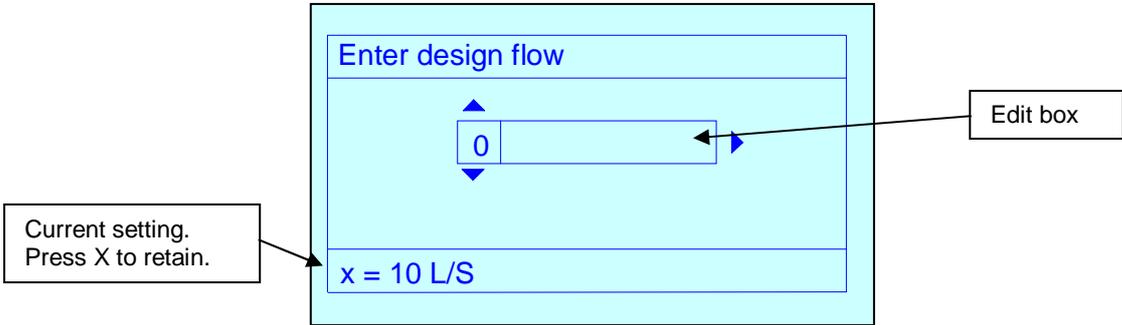
The handwheel position for variable orifice valves is required so that the correct value of Kvs is used for the derivation of the flowrate.

This screen allows the position to be edited.

The display shows the maximum and minimum recommended positions for the valve. The minimum position shown ensures that the valve maintains reasonable accuracy.

Design flow

The design flow for the selected valve can be edited in this screen.

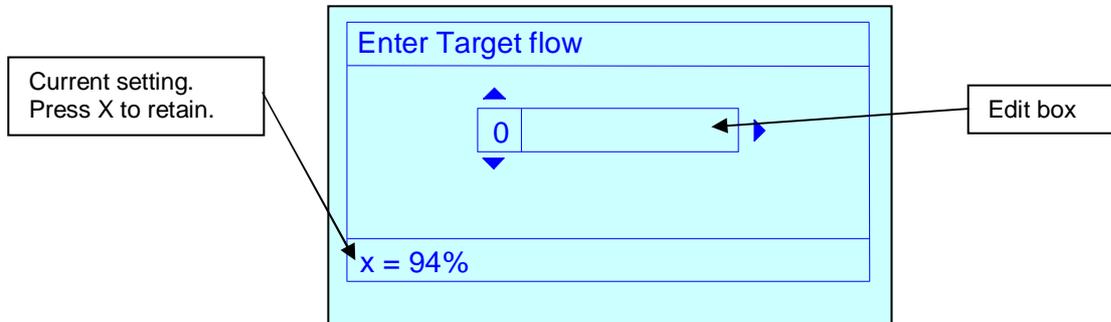


When a value is entered, the actual flow will be calculated as a percentage of the design flow and will be displayed on the Multi display in the design flow box.

Design flow can be entered in any of the units selectable in the units screen.

Target flow

The target flow for the selected valve can be edited in this screen.

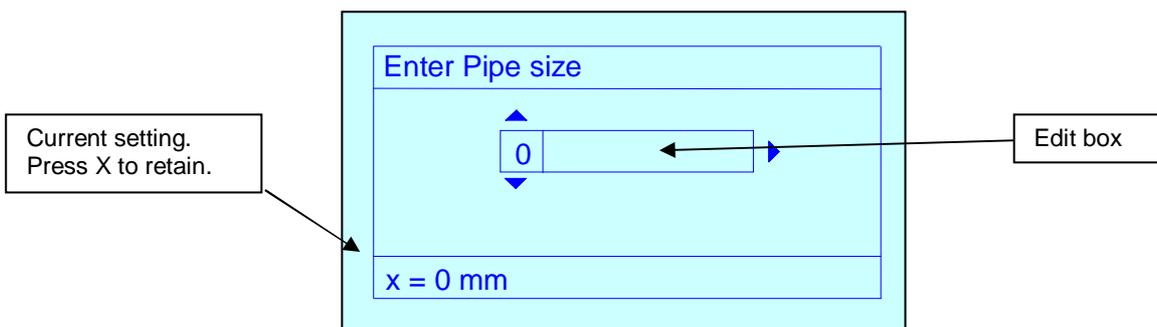


When a value is entered it will be displayed on the main display in the target flow box.

Target flow must be entered as a percentage and is generally derived when carrying out proportional balancing. Typically, the value used will be the same as the calculated design flow percentage on the index circuit.

Balancing to 100% target on subsequent valves will ensure that valves adjacent to the index valve are balanced.

Pipe size

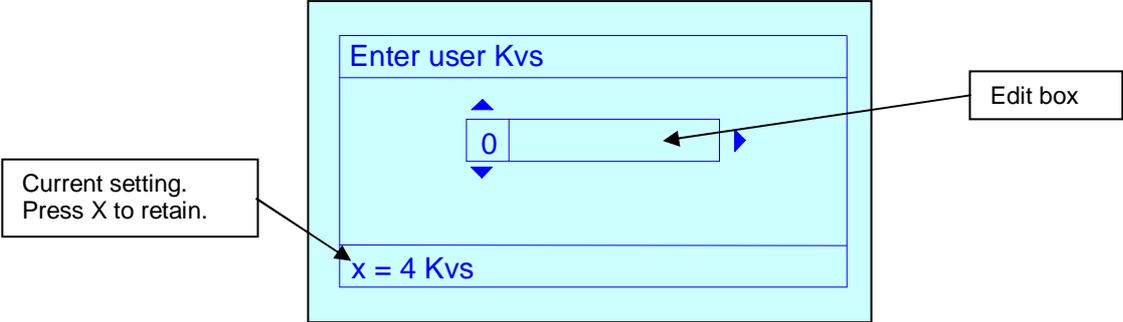


Pipe size is entered if the user wishes to use the unit to establish the velocity in the pipe. To display velocity choose a velocity unit from the Units menu. The velocity menu is located under the flow options within the units menu.

User Kvs

This screen allows for the user to enter the Kvs value of a measuring device that is not held in the database of valves. Typically this would be a fixed orifice device. When a Kvs is

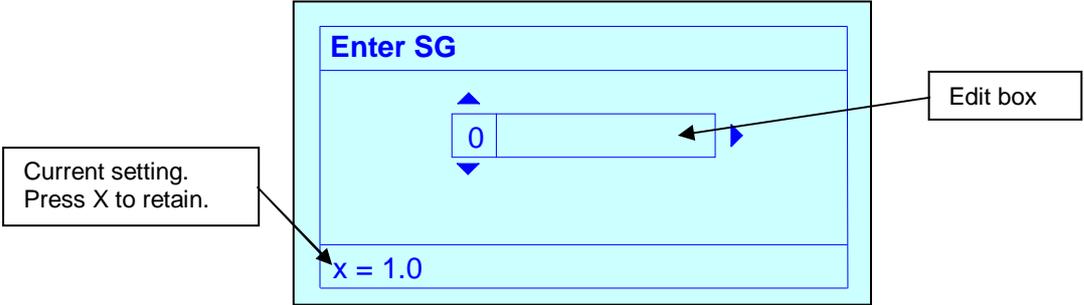
required for a variable orifice device then the Kvs is required for **each position** of the handwheel.



Contact Comdronic for advice on upgrading valve database.

Change SG (Specific gravity)

This screen allows the user to enter the value of the SG. Typically this would be used when glycol or other antifreeze agents are used in the system.



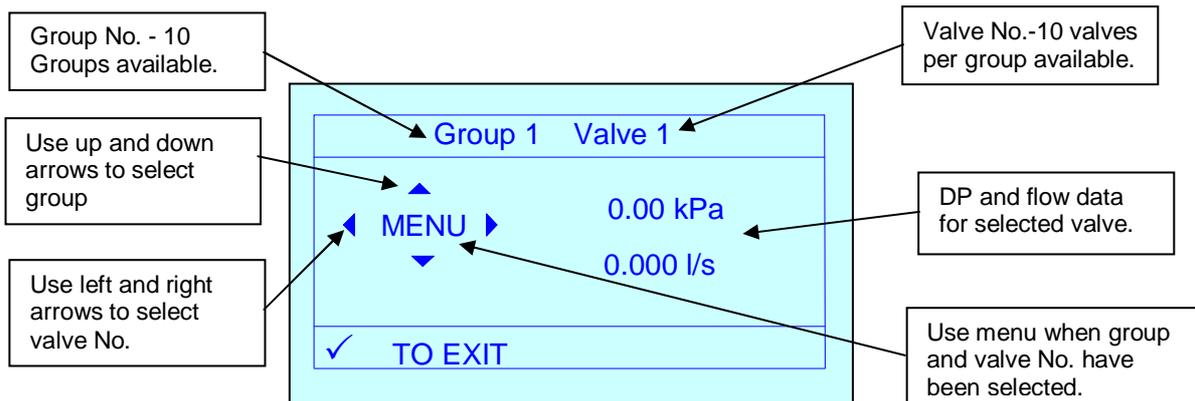
It will be necessary to derive the SG from a look up chart – see later Chapter

Note: When an SG is set to a value other than 1.0 an advisory note is added to the top of the display

Quick Valve.

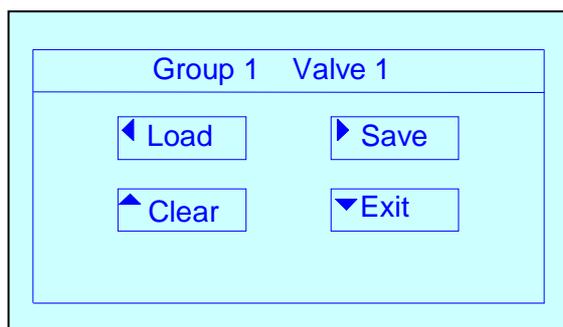
This display allows the user to save the data from the current valve to a project.

To use this feature press the Tick button whilst viewing any of the display screens.



The project can be made up from up to ten groups of valves each with ten valves. The group number can be selected using the UP and DOWN arrows and the valve number can be selected using the LEFT and RIGHT arrow keys.

The menu button gives the user the save or delete options. If the screen is black then a valve is already in the location, however If the screen is white then it is possible to load a valve to this location.



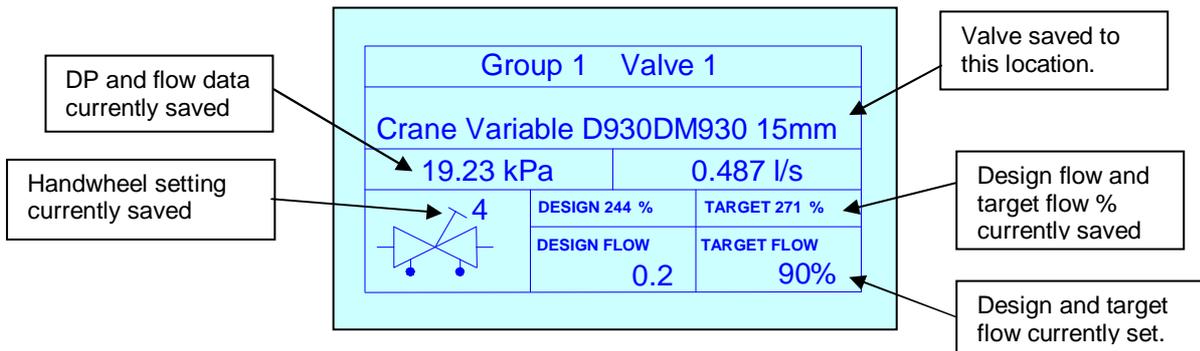
Using the SAVE command will overwrite the location with the current valve data. The quick valve feature allows the user to save the selected valve to a memory location which is quickly accessible without having to use the 'Select Valve' option. The purpose of this is to reduce time when commissioning a system with say 3 different types of valve. The 3 types of valve could be saved to the quick valve memory including the design flow designated for that valve. When recalled the valve will be loaded to the unit including the design flow.

Follow the on screen instructions to save the current selection or delete the existing saved valve.

An additional use for this feature is the ability for the user to save the commissioned data for up to 100 valves on a project for reference later prior to producing a commissioning report.

When the data for the selected valve has been saved the following screen appears.

The example shown is for a VODRV – all other valve types have a simpler screen.



Further options for saving valve data are available if the software option is purchased with the AC6 unit. PcomPRO project application software gives the user the option of preparing a project on a PC prior to commissioning the system. The data from the commissioning can be saved to the AC6 for further use when returning to the office. Instructions for PcomPRO are available on disc along with the software.

'Advanced' menu

Flow alerts

Flow alerts can be switched between off and on. The alerts relate to the flow in the selected valve, high flow means that the measured flow is outside the range normally expected in the valve. Similarly, if the flow is low then it is below the expected value.

High/low flow alerts

Enabled

Disabled

When working on unstable or systems that have little regulation the alerts can sometimes impede commissioning operations.

Light timer

The light timer sets the period of time that the light remains on. Pressing any key will re-activate it.

Setting the light to a short time will preserve battery life.

Select light on time

<input type="checkbox"/>	1 Min
<input checked="" type="checkbox"/>	5 Min
<input type="checkbox"/>	10 Min
<input type="checkbox"/>	Always on

Use up and down arrow buttons to select option followed by tick button to accept.

Auto off timer

The Auto off timer sets the time the unit remains on.

Setting the time to a short time will preserve battery life.

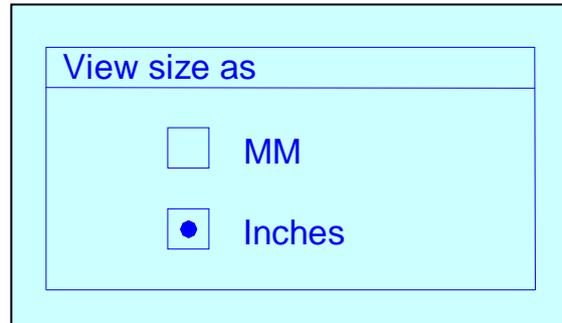
Select auto off time

<input type="checkbox"/>	1 Min
<input checked="" type="checkbox"/>	5 Min
<input type="checkbox"/>	10 Min
<input type="checkbox"/>	Always on

Use up and down arrow buttons to select option followed by tick button to accept.

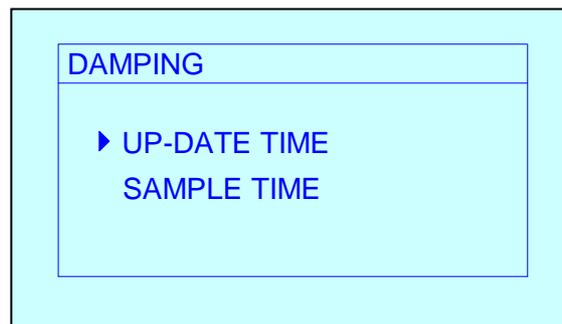
View size as

This screen allows the user to select the preferred units for selecting valve size. The default unit is metric. (mm)



Use up and down arrow buttons to select option followed by tick button to accept.

DAMPING MENU

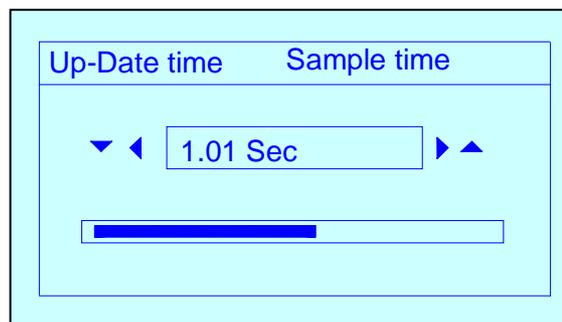


Use up and down arrow buttons to select option followed by tick button to accept.

Up-date time

This screen allows the user to change the apparent sensitivity of the AC6.

This value is set by the user to increase or decrease the time delay between each screen update. If the time is short then the screen updates often. A long update time will give the appearance of a steadier reading.

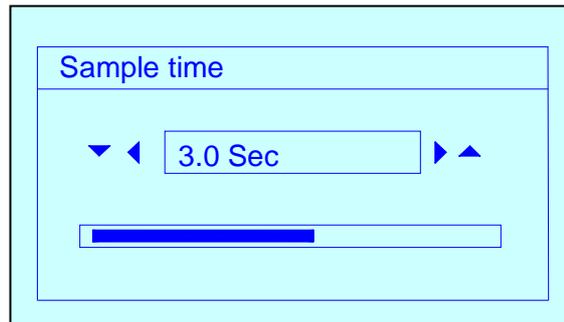


Use up and down arrow buttons for coarse adjustment and left / right arrow buttons for fine adjustment. Typical setting would be 1 second.

Note: Increase this time on an unstable system.

Sample time

This screen allows the user to change the period over which the readings are averaged.



Use up and down arrow buttons for coarse adjustment and left / right arrow buttons for fine adjustment. Typical setting would be 3 seconds.

This value can be edited up to 11 seconds and it represents the base time over which the readings are taken for the rolling average system.

A typical time of 3 seconds allows a large number of readings to be taken before the mean calculation is made.

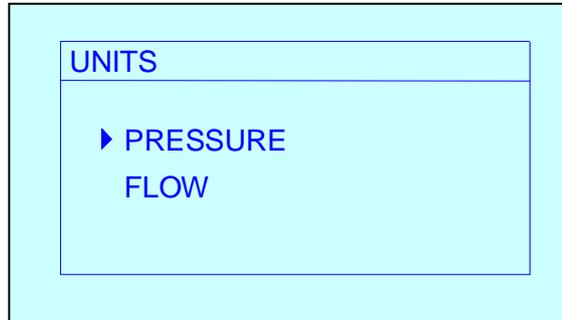
The averaging system continues to use 3 seconds of measured values but on a rolling average basis.

Increasing the sample time will make the screen appear to update slower but with a more stable reading.

The sample time is also used as a time base when using the pressure chart display to study the pressure signal from the device being measured.

UNITS MENU

This screen gives the user the option of selecting the preferred units for display on the AC6.

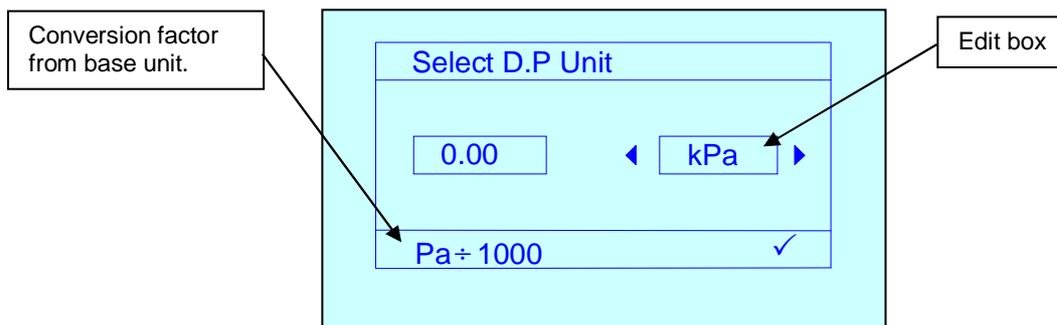


Use up and down arrow buttons to select option followed by tick button to accept.

Note: The AC6 firmware uses Pascals and L/s for all internal calculations. The AC6 will convert other units to this standard for processing before converting back for display purposes.

Pressure

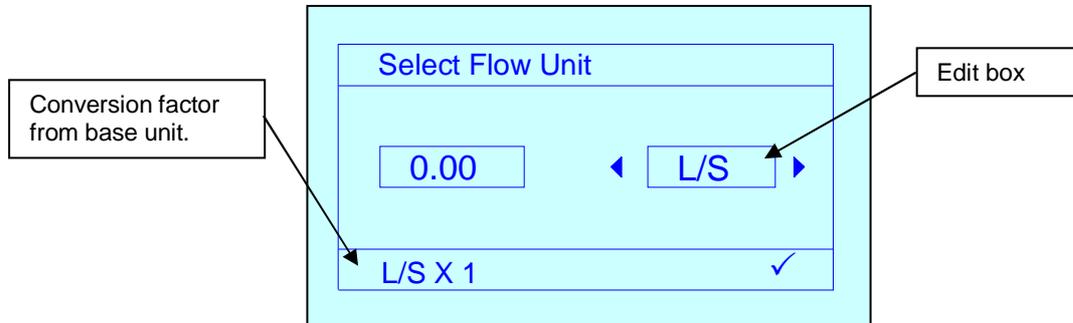
This screen will display differential pressure units. The menu right button will change the displayed units to **kPa, PSI, BAR, mm H₂O, cm H₂O Pascals. Inches water gauge, Feet head**



Use up and down arrow buttons to select option followed by tick button to accept.

Flow

This screen will display volume flow units. The Menu right button will change the units through **L/s, L/M, L/hr, USGPM, UKGPM, M³/h, M³/m, M³/s**



Use up and down arrow buttons to select option followed by tick button to accept.

Note: Velocity units are available (Metres per second and Feet per second)

In order to display the current velocity in the system being measured it will be necessary to select the following:

- 1 - Select valve being measured (Main menu)
- 2 - Enter pipesize (Main menu)
- 3 - Select velocity units (Units menu)

Use up and down arrow buttons to select option followed by tick button to accept.

7. AUTOMATIC BALANCING VALVES

Unique to the AC6 is the ability to display variables associated with automatic balancing valves.

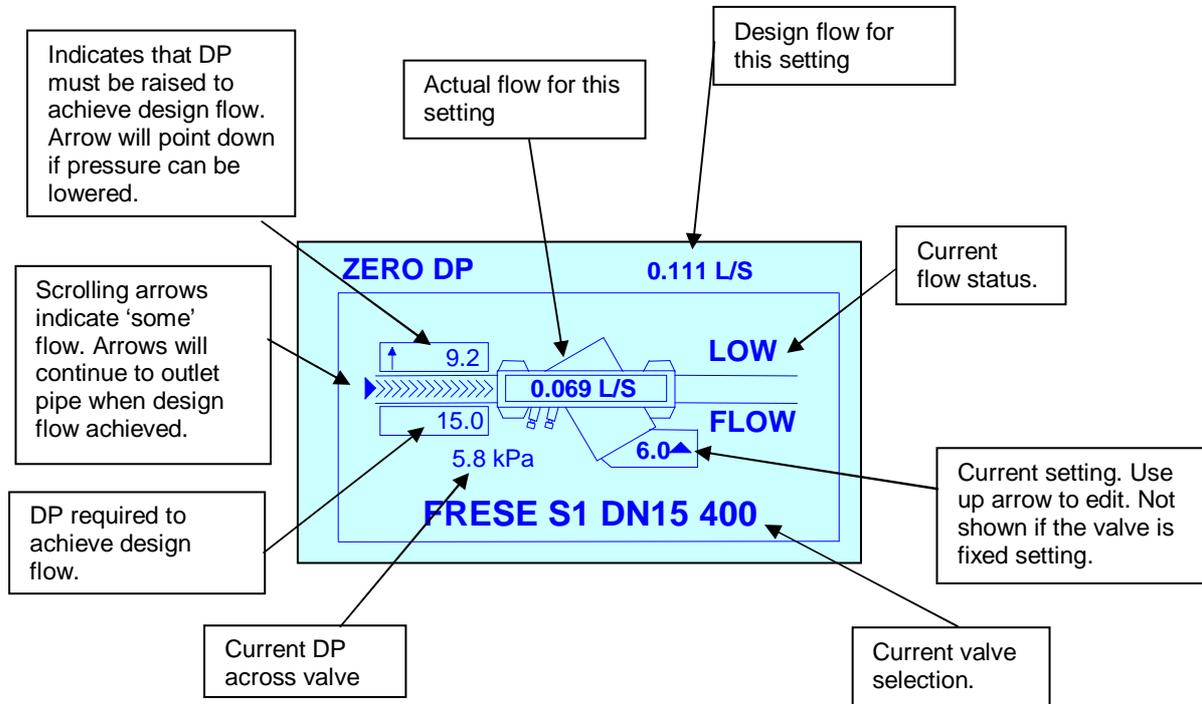
The AC6 firmware has been arranged to display data for with three types of automatic flow controller:

- 1 - Fixed internally adjustable cartridge type.
- 2 - Fixed cartridge type.
- 3 - Externally adjustable types.

The displays associated with this type of valve are automatically selected when the valve maker and model etc are selected.

For full information it is recommended that the MULTI DISPLAY is selected as shown below.

The valve shown is externally adjustable type.



If a valve is selected that is not adjustable either internally or externally then the setting tab is not shown on the valve image.

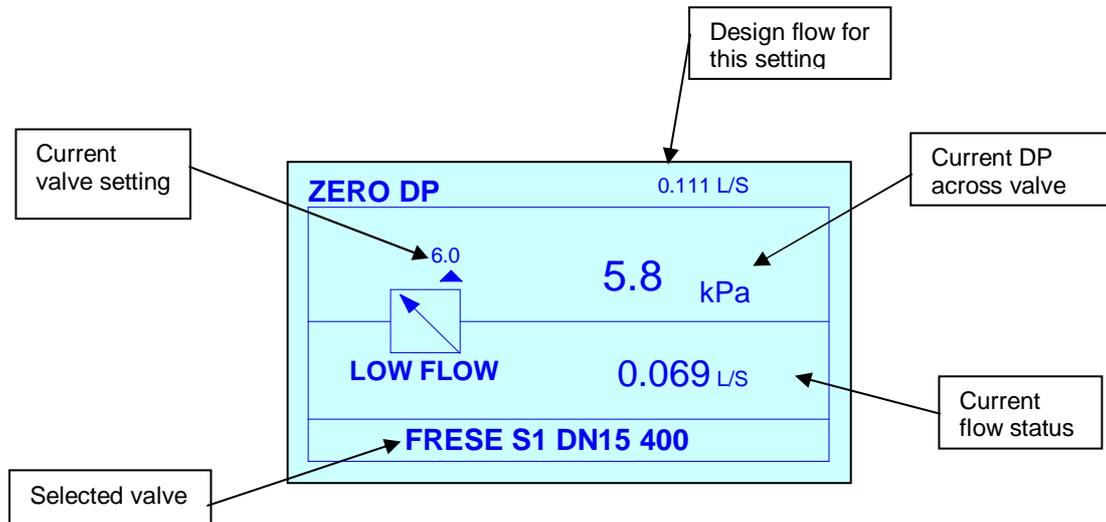
The design flow for any automatic flow controller will be achieved if the differential pressure across the valve reaches the design value. Each automatic balancing valve and each setting for the valve will possibly have a different design DP. The AC6 database holds the design DP for each valve/setting. Many of the automatic balancing valves programmed into the AC6 have their actual characteristic in the data. The level of differential pressure across the valve will determine which data is used. Generally with automatic valves there is a slight fall in flow when the DP reaches high values. This fact is true for most automatic valves but normally the fall in flow is within the stated tolerance for the valve.

When the AC6 is adjusted to select the correct valve/setting the design flow is displayed within the valve image. If the DP is not sufficient to create correct flow conditions the box above the inlet pipe to the valve will display an up arrow and a value indicating that the DP will need to be increased to achieve the design flow. The value displayed is the design DP less the actual DP.

In the event of the actual DP being higher than the design DP then the box will display a down arrow and a DP value that suggests a reduction in actual DP. – On an Index circuit this would suggest that the pump speed could be decreased to achieve the correct DP value.

If the design flow is not met, then the message **LOW FLOW** will be displayed. If the design flow is met then the message will be **FLOW OK**.

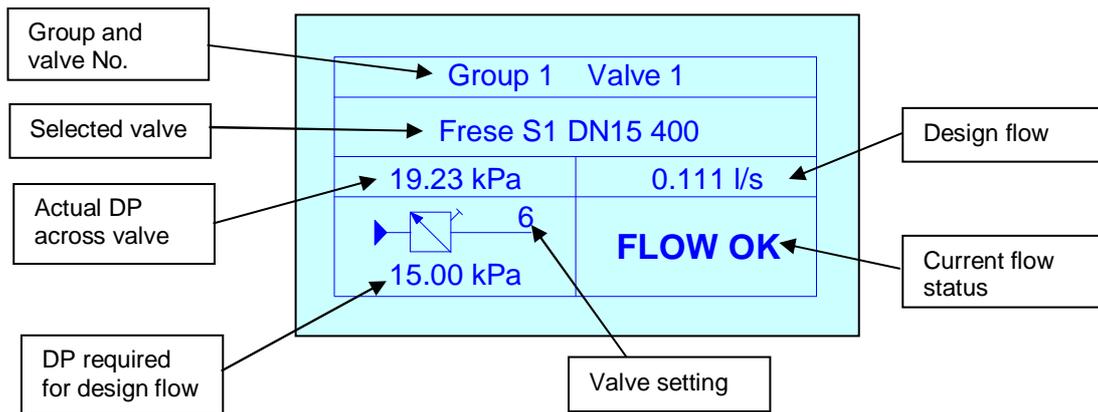
For a simplified display the Flow/pressure display is recommended.



Quick valve (When using automatic flow controllers)

The procedure for using quick valve is the same as if traditional balancing valves are in use. Press the tick button whilst any of the display screens are in use and the user will be prompted to select group and valve No.

The screen showing saved data is shown below.



The above example shows that the actual DP is greater than the design DP therefore the flow status is displayed as FLOW OK.

8. Spares and Accessories

Toolbelt – Ideal for the new ‘Working at Height Legislation’ .

Pocketed and padded High visibility bib (BS EN 471) for carrying AC6, mobile phone, pens and notebooks etc.

Replacement and Additional Hoses – up to 3 metres in length.

Industry Standard Insertion Test Points.

Mechseal Adaptors.

9. Technical Specification

Measurement Range/Accuracy Standard AC6 meter

0-200 kPa Differential measurement

0-10 bar common mode static pressure

0.3 kPa to 0.99 kPa Accuracy +/-0.03 kPa

1.0 kPa to 9.99 kPa Accuracy +/-0.1 kPa

10 kPa to 200 kPa Accuracy +/- 1.0% Reading

Hysteresis 0.2% span – (zeroing will remove this)

Measurement Range/Accuracy High pressure AC6 meter

0-600 kPa Differential measurement

0-20 bar common mode static pressure

1 kPa to 20.00 kPa Accuracy +/-0.2 kPa

20 kPa to 600 kPa Accuracy +/- 2.0% reading

Hysteresis 0.2% span – (zeroing will remove this)

Effective Operating Time

20 hours with standard Alkaline PP3 battery

Sensor protection. (Standard unit only)

Unique DSP technology™ ensures that the sensor is protected against accidental overpressure. The system maintains a differential pressure of below approx 3.5 bar even in the event of a single pressure connection being removed. In this situation one side of the sensor is at atmospheric pressure whilst the other is at full system static pressure- a situation which could cause sensor failure if not protected against.

Calibration.

Standard factory calibration is carried out in controlled conditions using calibrators traceable to National Standards. It is recommended that AC6 units are re-calibrated at least once per year. This recommended period is not fixed. Should the AC6 unit be used on systems with dirty water or a high concentration of cleaning agents, treatments or the user suspects that readings are not perfect then re-calibrate more often.

Valve Database

The AC6 can be programmed with up to 3100 valves which are held on the factory database.

In general, two database lists are programmed into the AC6. The European list is the most extensive with the US list being less extensive.

Valve data can be added to the AC6 in a number of different ways – Contact your supplier for more details.

User Interface

The AC6 unit is fitted with a memory card for holding data. There is not normally any reason for accessing the data on this card. Contact Comdronic Ltd for information if valve data is to be updated as there are some important procedures to be followed to edit the data correctly.

10. Statement of Conformity

This is to certify that the COMDRONIC™ COMMISSIONING UNIT

Manufactured in the EU has been calibrated in accordance with standards traceable to national standards and conforms to the published specification. It is CE marked in accordance with the relevant EC directives.

11. Contacting Us

For all enquiries, troubleshooting, technical and sales contact us at any of the following:-

e-mail: amckenzie@comdronic.co.uk

Tel +44 (0) 1473 715589

Fax: +44 (0) 1473 715589

Address: Unit 7 Alpha Terrace, West Road, Ipswich, Suffolk, IP3 9SX, UK

Visit our website at www.comdronic.co.uk

12. Glycol/water SG chart



SPECIFIC GRAVITY OF WATER / GLYCOL MIXTURES

Temperature	% Glycol additive										
Deg C	0	10	20	30	40	50	60	70	80	90	100
80			0.991	1.003	1.017	1.026	1.036	1.046	1.054	1.062	1.068
70		0.990	1.000	1.010	1.023	1.034	1.042	1.053	1.062	1.069	1.075
60		0.995	1.007	1.017	1.030	1.041	1.050	1.060	1.070	1.076	1.083
50		1.000	1.013	1.013	1.035	1.048	1.057	1.067	1.077	1.084	1.090
40	0.990	1.004	1.018	1.029	1.042	1.054	1.064	1.074	1.085	1.091	1.098
30	0.996	1.007	1.022	1.034	1.047	1.059	1.070	1.080	1.092	1.099	1.105
20	0.999	1.010	1.026	1.038	1.052	1.065	1.076	1.088	1.099	1.106	1.114
10	1.000	1.013	1.028	1.042	1.056	1.070	1.082	1.094	1.105	1.113	1.120
0	1.000	1.015	1.029	1.045	1.061	1.075	1.088	1.100	1.112	1.120	1.128
-10				1.048	1.065	1.079	1.092	1.107	1.118	1.127	1.135
-20					1.068	1.083	1.097	1.113	1.124	1.133	1.136
-30						1.087	1.100	1.118	1.128	1.137	1.137
-40							1.102	1.122	1.133	1.138	1.138

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