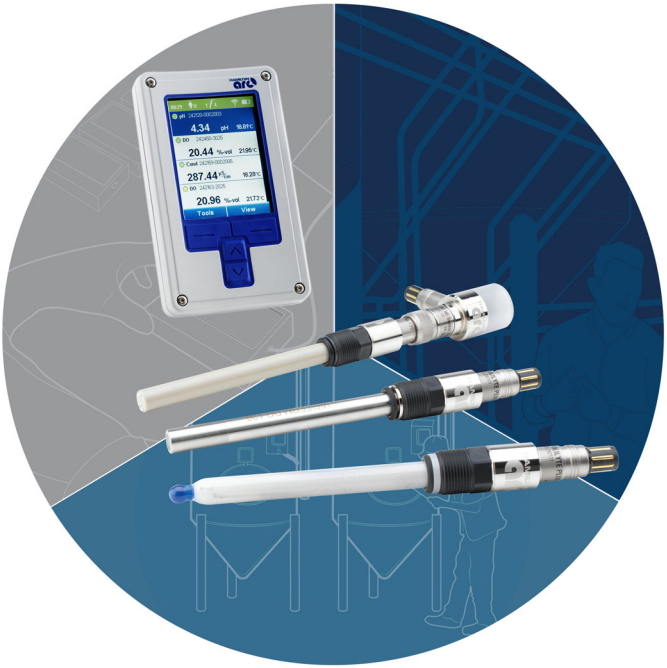
HAMILTON ARC System

ARC View Handheld
Operator's Guide Reference Version

FW Version 024



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PN 624255/01	HAMILTON ARC System ARC View Handheld Operator's Guide Revision 01. April 2010. FW Version 023.
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PN 624298/01	HAMILTON ARC System ARC View Handheld Operator's Guide Reference Version Revision 01. November 2010. FW Version 024.

List of Contents

Section 3, Handheld screen reference

Section 4, Troubleshooting

Appendix A, ARC System components

Appendix B, ARC System firmware updates

Appendix C, Sensor STAtus profile

Index

Foreword

About the ARC System

The HAMILTON ARC System is an advanced, integrated environment offering efficient and safe wireless and wired communication for the monitoring and management of sensors of many kinds.

Combining the cost savings and reliability of ARC sensors with the power, convenience, and portability of the ARC View Handheld management unit, users benefit from automated standard calibrations in the laboratory, product calibrations in the process environment, and instantaneous oversight of up to 30 sensors at all times.

About this manual

This manual is for all operators of the HAMILTON ARC process analytics system. The manual serves two functions:

- It gives an overview of the integration of the complete ARC system: sensors, cables, and ARC Wi Sensor Adapters.
- It explains in detail the use of the ARC View Handheld.

How to use this manual

First, make sure you are familiar with the Handheld's basic functions, and that you understand what Users, Administrators and Specialists are. You can learn about these in Section 1, *Overview and theory*.

Then, try performing some of the tasks that your job requires of you. There is help about this in Section 2, *Handheld tasks tutorial*.

If you have difficulty understanding a screen or a field, use Section 3, *Handheld screen reference*. If you have difficulty finding the field you want, use the index in the back of the manual.

Safety notices

- The ARC View Handheld is environmentally protected to standard IP 67. The Dock, however, is not. For this reason, use the Dock only in dry locations.
- Do not open the power adapter.
- Do not use the ARC system or any ARC system component in an explosive environment (ATEX zones).
- Use only wired digital or analog connections for the process control. The ARC wireless interface is designed for sensor monitoring, maintenance, and service purposes.

- Do not open the ARC View Handheld. Only trained service technicians are permitted to exchange the internal battery.
- Do not use the internal temperature sensor of any ARC sensor to control the temperature of a process.

Equipment warnings

- Do not use solvents, strong acids, bases, or ammonia (NH_3) in gaseous or any other form to clean the ARC View Handheld or the Dock.
- Be sure not to damage the screen of the Handheld when cleaning. Small particles of dirt on a cloth can cause scratching. A new paper tissue is recommended.

Typographic standards in this manual

Example	Explanation
`Graph`	Courier font indicates text on the Handheld screen.
`View`	Courier font, underlined, indicates a soft-key on the Handheld screen.
`[`*`Sensor`*`]`	Courier font, italic with square brackets indicates a variable on the Handheld screen. `[`*`Sensor`*`]` indicates any ARC sensor shown on the Handheld screen.

Section 1 Overview and theory

This section gives a detailed description of the HAMILTON ARC View Handheld, and of the principles and theory that lie behind its use with other components in the ARC System.

Section 1.1 Getting started

Your ARC Handheld package includes the following components:

- ARC View Handheld and Dock.
  You can find specifications for these items in Table A.1, *ARC View Handheld specifications*, on Page 134.

- Power supply for Handheld and Dock.
  This unit requires a power source of 100 to 240 V, and has adapters for standard power sockets in Europe, Great Britain, Australia and the USA.

- ARC Cable VP 8.
  This is a data and power cable between a sensor and the Dock.

Section 1.2 Setting up the ARC View Handheld

The HAMILTON ARC Handheld is easy to set up and convenient to use as a configuration and calibration tool for HAMILTON ARC sensors.

The following steps describe the setup procedure for both wired and wireless connection options:

1. Connect the provided ARC Cable VP8 to the Dock.
2. Connect one of the ARC sensors (not included in this package) to the VP8 plug of the sensor cable.
3. Place the ARC View Handheld in the Dock.
4. Connect the Power Adapter Cable to the Dock, and plug the Power Adapter into an suitable power outlet (100 to 240 V ac).
5. Turn the Handheld on by pressing the Left and Right keys together for 3 seconds. After startup, the Handheld recognizes and displays the connected sensor automatically.

NOTE: In this setup, the Handheld functions as a desktop system for a laboratory environment, not an industrial environment.

For wireless connection:

1. Plug the ARC Wi Sensor Adapter (not included in this package) between the ARC sensor and the sensor cable.
2. Take the Handheld out of the Dock.
   The wireless connection is established automatically.

NOTE: In this setup the Handheld can be used as a mobile tool for both laboratory and industrial applications

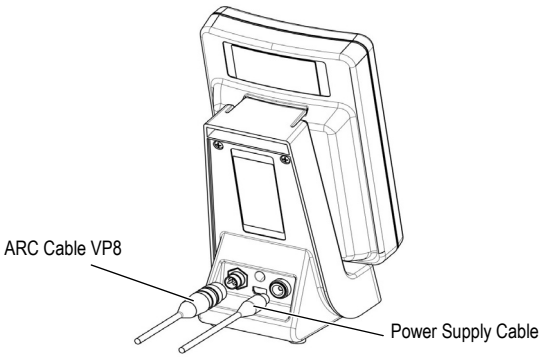


Figure 1.1 Plugs on the ARC View Handheld Dock

Section 1.3 ARC View Handheld keys and interface

Switching on and off

To switch on the Handheld, press the Left and Right Keys together for three seconds. To switch off the Handheld, press the Down Key for three seconds. For more information, see Section 1.4, *ARC View Handheld power management*, on Page 16.

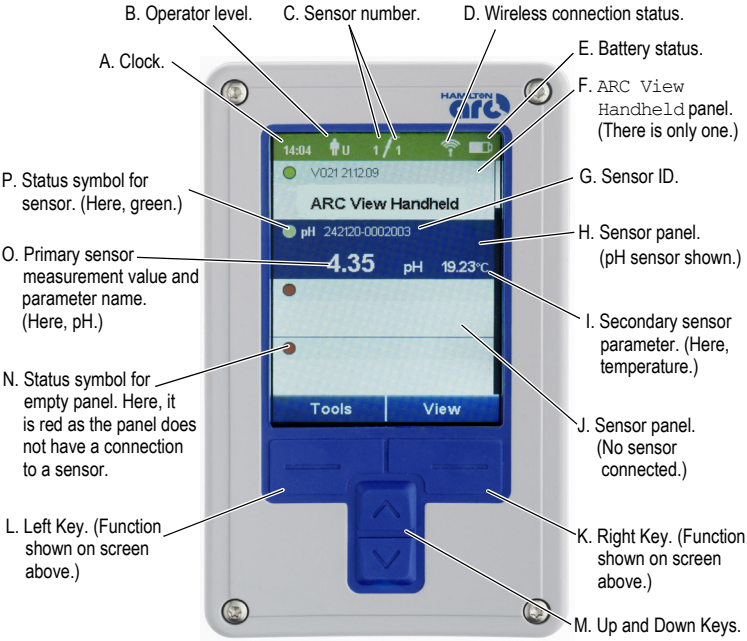


Figure 1.2 The ARC View Handheld showing top level of interface, pH sensor attached

Symbol or field	Function
A. Clock	Real time clock. Shows time of day in 24-hour format. **NOTE:** For information about adjusting the clock, see Task 2 on Page 47.

Table 1.1 ARC View Handheld keys and interface

Symbol or field	Function
B. Operator level	Displays the current operator level of the selected sensor. **NOTE:** For detailed information, see Section 1.5.2, *ARC sensors: operator levels*, on Page 19.
	 There is no panel selected on the Handheld. This is the case when the Handheld is first switched on.
	 The `ARC View Handheld` panel or sensor panel selected in the Handheld has its operator level set to **U**ser.
	 The `ARC View Handheld` panel or sensor panel selected in the Handheld has its operator level set to **A**dministrator.
	 The `ARC View Handheld` panel or sensor panel selected in the Handheld has its operator level set to **S**pecialist.
	In addition, the letter **D** (for which a special password is required) can indicate a level used by HAMILTON service personnel.
C. Sensor number	The first field displays the number of the sensor selected on the Handheld as it appears within the list of sensors currently being monitored by the Handheld. The second field displays the total number of sensors monitored by the Handheld. For example, '4/7' means that Sensor 4 is selected within a list of seven sensors displayed on the Handheld. **NOTE:** • Do not confuse the sensor number with the sensor's Modbus device address or Sensor ID. • For more information, see Section 1.5.5.2, *Modbus device addresses*, on Page 25.
D. Connection status	**NOTE:** For information about dealing with failed wireless connection, see Section 4, *Troubleshooting*.
	 No communication between the handheld and the selected sensor is possible, wireless or wired.
	 Wireless connection between the Handheld and the selected sensor is poor or non-existent. Wired connection, if present, is OK.
	 Wireless connection between the Handheld and the selected sensor is poor.

Table 1.1 ARC View Handheld keys and interface

Symbol or field	Function
	 Wireless connection between the Handheld and the selected sensor is moderate.
	 Wireless connection between the Handheld and the selected sensor is excellent.
E. Battery status	If your Handheld's battery life between charges is shorter than about 5 hours, have the battery replaced.
	 Battery 1/3 full.
	 Battery 2/3 full.
	 Battery full.
	 Battery charging in Dock (levels flash continuously).
F. `ARC View Handheld` panel	The top-most level of the Handheld's user interface is divided into four visible panels and 27 invisible panels. If a sensor is displayed on a panel, whether visible or currently invisible, you can scroll to it with the Up and Down keys. The `ARC View Handheld` panel is positioned above the sensor panels, and by default is out of sight when the Handheld is first switched on. The `ARC View Handheld` panel gives access to screens enabling configuration of the Handheld.
G. Sensor ID	Displays a text string uniquely identifying the selected sensor. By factory default, the Sensor ID is the sensor's part number followed by its serial number.
H. Sensor panel	The top-most level of the Handheld's user interface is divided into four visible panels and 27 invisible panels. If a sensor is displayed on a panel, whether visible or currently invisible, you can scroll to it with the Up and Down keys. The sensor panel displays an overview of measurement data from the sensor you select using the Up and Down Keys. You can then press the Right Key to `View` more detailed data, or the Left Key to access `Tools` for calibration and configuration of the corresponding sensor.
I. Secondary sensor measurement parameter	The sensor's secondary parameter (temperature), the measurement unit, and the current value are displayed here.

Table 1.1 ARC View Handheld keys and interface

Symbol or field	Function
J. Sensor panel (no sensor connected)	The top-most level of the Handheld's user interface is divided into four visible panels and 27 invisible panels. If a sensor is displayed on a panel, whether visible or currently invisible, you can scroll to it with the Up and Down keys. This panel is blank in Figure 1.2 because there is no sensor associated with it. As soon as a new ARC sensor is added to the ARC System, a new wireless connection will be automatically created, and information will be shown here.
The functions of the Right and Left Keys are context-dependent. Functions are indicated by the software field immediately above each key. **NOTE:** Press the Left Key and Right Key together for three seconds to switch on the Handheld.	
K. Right Key	Click `View` to view information about the selected panel. (The panel can be the `ARC View Handheld` panel, or any sensor panel.) Menus and further screens give access to structured, detailed information.
	Click `OK` to see more screens for the field you have selected, or to confirm selections made with the Up Key and the Down Key.
	Click `Back` to move backwards through the menu system, 'jumping' several steps where necessary, to the first level `Tools` or `View` menu.
L. Left Key	Click `Tools` to access tools for the selected panel. If the selected panel is the `ARC View Handheld` panel, further screens enable you to configure the Handheld. If the selected panel is a sensor panel, further screens enable you to calibrate and configure the sensor. **NOTE:** You must enter a password to use some of the screens under `Tools`. (See Task 1 on Page 41, and Task 1 on Page 46.)
	Click `[Back arrow]` to move backwards through the menu system, one step at a time.
M. Up Key	Scrolls up.
M. Down Key	Scrolls down. **NOTE:** Press the Down Key for three seconds to switch off the Handheld.
N. Status symbol for empty panel	Displays status: empty panels that are not associated with a sensor always display a red status symbol.

Table 1.1 ARC View Handheld keys and interface

Symbol or field	Function
O. Primary sensor measurement value and parameter name	The parameter shown in this field depends on the sensor displayed: • `Cond` = Conductivity • `pH` = pH • `DO` = Dissolved oxygen ARC sensors measure a secondary parameter (always temperature) in addition to the primary one. The secondary parameter is shown to the right of the primary one.
P. Status symbol for sensor	Status colors for a sensor, shown on the Handheld (as here) and status colors on the ARC Wi Sensor Adapter do not have the same meaning. For more information, see: • Section 1.5.3, *ARC sensors: operational status*, on Page 20. • Section 4.2, *Troubleshooting Handheld sensor status colors*, on Page 126.
	 GREEN Continuous: Sensor and connection functioning correctly. Flashing: Updating data.
	 YELLOW Continuous: Sensor indicates error or warning message. Flashing: Updating data.
	 RED Continuous: Sensor or connection not functioning.

Table 1.1 ARC View Handheld keys and interface

Section 1.4 ARC View Handheld power management

Function	Action
Handheld switch-on	Press Left and Right Keys together for 3 seconds.
Handheld switch-off	Press Down Key for 3 seconds.
Handheld switch-off, automatic	Handheld not used for 20 minutes. **NOTE:** Specialists can change the default 20-minute timing with `Power settings` on `ARC View Handheld` → `Tools` → `Settings`.
Handheld reset	Push Down Key for 30 seconds.
Backlight switch-off, automatic	Handheld not used for 5 minutes. **NOTE:** Specialists can change the default 5-minute timing with `Display settings` on `ARC View Handheld` → `Tools` → `Settings`.
Handheld wake-up, when backlight switched off	Press any key.

Table 1.2 Power management functions

Section 1.5 ARC system components and principles

You should be familiar with the following components and principles before operating the Handheld in a real working environment.

Section 1.5.1 ARC sensors: communications

Section 1.5.1.1 Overview

Every HAMILTON ARC System sensor has two kinds of interface. These comprise:

- Two analog 4-20 mA interfaces (with the exception of the VISIFERM DO ARC, which has one).
- One digital RS485 Modbus RTU interface.

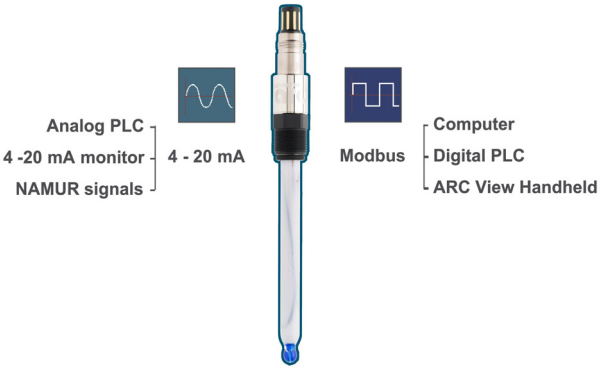


Figure 1.3 HAMILTON ARC sensor with analog and digital interfaces

Analog interfaces

The sensor's two analog interfaces are mapped to its two measurement parameters in the following manner during factory configuration of the sensor:

- mA interface #1: Parameter 1
  (Conductivity, pH, or dissolved oxygen, depending on sensor).
- mA interface #2: Parameter 2
  (Temperature, except for the VISIFERM DO ARC sensor, which does not have a second analog interface).

However, Specialists can change the interface/parameter configuration, if required.

In addition, the relationship between the values measured by the sensor, and the output signals from the interface can also be configured by the Specialist.

You can find out more about all these aspects of the analog interface in Section 1.5.6, *ARC sensors: analog interface configuration*, on Page 26.

Analog interface connections between a sensor and a control device such as a PLC are always wired.

Digital RS485 Modbus RTU interface

The sensor's RS485 Modbus digital interface is used for wired connections to other hardware. An ARC Wi Sensor Adapter mounted on each ARC sensor is required for wireless connection, and provides the radio functionality. (However, the sensor also requires a separate, wired, power supply.)

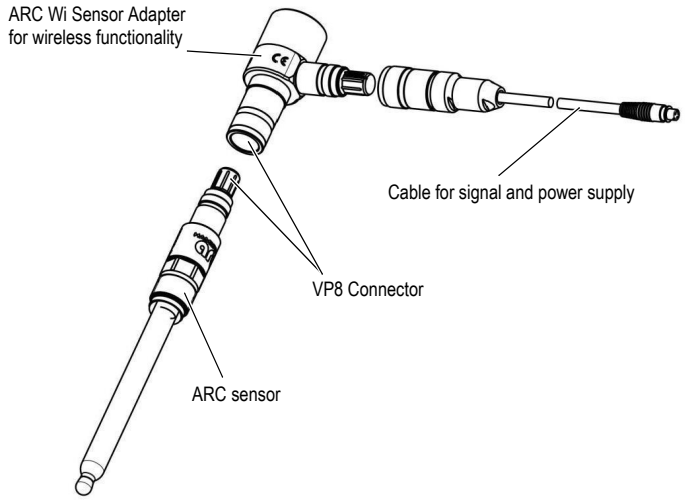


Figure 1.4 HAMILTON pH ARC sensor, showing ARC Wi Sensor Adapter and cable

Section 1.5.1.2 ARC sensor communication with a PLC system

Connection to a PLC system can be by means of the sensor's analog or digital interfaces, depending on whether the process control system accepts analog or digital inputs. If necessary, both digital and analog interfaces can function at the same time.

For reasons of safety, connection to a process control system is always wired.

Section 1.5.1.3 ARC sensor communication with a Handheld

Sensor communication with a Handheld is always digital. It can be wired or wireless. Wired mode can be useful for testing, configuring, and calibrating sensors outside a process environment. Wireless mode (using an ARC Wi Sensor Adapter mounted on the sensor) is suitable for process environments.

By default, wireless communication between the Handheld and the sensors starts automatically when you take the Handheld from its Dock (Figure 1.5).

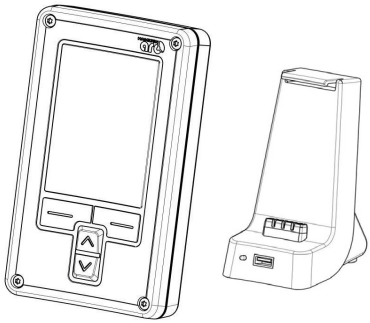


Figure 1.5 The Handheld starts wireless communication when removed from its Dock

Similarly, wireless communication switches off automatically when you replace the Handheld in its Dock.

Up to 30 sensors can be wirelessly connected to the Handheld at the same time, but only the four (or fewer) that are currently visible on the screen are actively monitored.

Section 1.5.1.4 ARC sensor communication with a computer

A computer running the *ARC Sensor Configurator* freeware is an alternative to the Handheld in many respects: it has slightly greater functionality, but cannot operate wirelessly.

Sensor communication with a computer always takes place by means of the RS485 Modbus digital interface using a wired connection. If you wish to connect a sensor to a computer, you require both a cable to connect to one of the computer's USB ports and also an RS485/USB adapter. (For more information, see Appendix A, *ARC System components*.)

Section 1.5.2 ARC sensors: operator levels

Every ARC sensor always has its current operator level value stored in its memory. The ARC System supports three operator levels (Table 1.3).

Operator level	Password	Actions possible	Tasks possible
User (U)	Not required	• Read sensor data.	• All tasks in Section 2.2, *User tasks*.
Administrator (A)	`18111978`	• Read sensor data. • Calibrate sensors.	• All tasks in Section 2.2, *User tasks*. • All tasks in Section 2.3, *Administrator tasks*.

Table 1.3 Actions and tasks possible at different operator levels (passwords are factory default)

Operator level	Password	Actions possible	Tasks possible
Specialist (S)	16021966	• Read all sensor data. • Calibrate sensors. • Configure sensors. • Configure Handheld. • Change passwords for operator level A and S. • Update ARC system firmware. • Create and download sensor status file. • Create and download sensor configuration profiles. • Restore factory settings.	• All tasks in Section 2.2, *User tasks*. • All tasks in Section 2.3, *Administrator tasks*. • All tasks in Section 2.4, *Specialist tasks*.
In addition, operator level D (for which a special password is required) is used by HAMILTON service personnel.			

Table 1.3 Actions and tasks possible at different operator levels (passwords are factory default)

On sensor power-up, a sensor falls back to the User operator level. This also happens when an operator working with the Handheld leaves the password-protected area of the Handheld.

When a sensor is set to the User operator level, it permits only User rights to any device accessing the data stored in its memory, and only User rights to perform some actions (Table 1.3).

However, by entering the Administrator or Specialist password in the Handheld, an operator can obtain Administrator or Specialist rights (Table 1.3).

Task 1, *Setting the Administrator operator level*, on Page 41 and Task 1, *Setting the Specialist operator level*, on Page 46 explain how you enter a password to obtain Administrator or Specialist rights.

Section 1.5.3 ARC sensors: operational status

Status colors on the Handheld and on the ARC Wi Sensor Adapter refer to the status of:

- The sensor.
- The sensor/Handheld connection.

NOTE:
- The status colors do not refer to the status of the Handheld.
- Status colors do not have the same meaning on the ARC Wi Sensor Adapter that they do on the ARC View Handheld.

Section 1.5.3.1 ARC View Handheld status colors

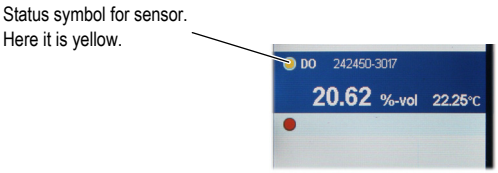


Figure 1.6 Status colors for sensors as shown on the ARC View Handheld

Color	Meaning
	If a sensor panel has a green dot, the sensor it represents is correctly sending data to the Handheld. The communication medium (wireless or wired), and the sensor are both functioning correctly. (Flashing green indicates that the Handheld is being updated with data from a correctly-functioning sensor. This is normal behavior.)
	If a sensor panel has a yellow dot, the sensor it represents has a warning or error status. The associated sensor and communications link are functioning, but the sensor reading is possibly compromised. In the picture above, the DO sensor is giving a parameter measurement, but is also sending a warning status signal. This could be, for example, because the last calibration failed, and the sensor therefore knows its reading is not accurate. (Flashing yellow indicates that the Handheld is being updated with data from a sensor with a warning or error status.) You can find more information about an active warning by going to `[Sensor]` → `Tools` → `Sensor status`, where you can read the warning message. You can find an explanation of all warning and error messages in Section 4.4, *Troubleshooting warning and status messages*, on Page 127 and Section 4.5, *Troubleshooting error messages*, on Page 130.
	If a sensor panel has a red dot, the sensor it represents has an undefined status. The sensor, the communications link (wireless or wired), or both sensor and link are not functioning at all.

Table 1.4 The meaning of status colors on the Handheld

For help in correcting an unsatisfactory status, see Section 4.2, *Troubleshooting Handheld sensor status colors*, on Page 126.

Section 1.5.3.2 ARC Wi Sensor Adapter status colors

NOTE: Sensor Adapter status colors do not have the same meaning as Handheld status colors. For more information, see Section 1.5.3.1, *ARC View Handheld status colors*.

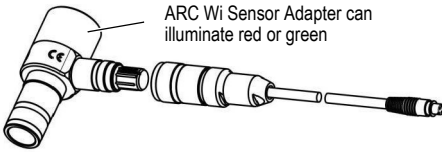


Figure 1.7 The ARC Wi Sensor Adapter

Sensor Adapter	Meaning
Does not illuminate	This is the normal sensor status. The sensor is correctly connected and functioning normally, and the panel corresponding to the sensor is not currently selected in the Handheld.
Illuminates green	Data is passing between sensor and Handheld. The sensor is correctly connected and functioning normally, and the panel corresponding to the sensor is currently selected in the Handheld.
Illuminates red	There are three conditions in which this can happen: • Power was switched on only a short time ago. The ARC Wi Sensor Adapter illuminates for a few seconds. • The sensor is not functioning. • There is no sensor is connected to the ARC Wi Sensor Adapter.

Table 1.5 The meaning of status colors on the ARC Wi Sensor Adapter.

For help in correcting a red status, see Section 4.3, *Troubleshooting ARC Wi Sensor Adapter status colors*, on Page 127.

Section 1.5.4 ARC sensors: two kinds of calibration

Section 1.5.4.1 Introduction

Calibration offsets the effects of time and wear on a sensor. Calibration of HAMILTON ARC Sensors can be carried out using:

- The ARC View Handheld
- The *ARC Sensor Configurator* freeware on a PC.
- The HAMILTON VisiCal device.
- A digital control unit (PLC, or PC Software) using the corresponding Modbus commands.

NOTE: In this manual, we will confine ourselves to calibration with the ARC View Handheld.

The ARC View Handheld offers two kinds of sensor calibration: automatic standard calibration, and product calibration.

With automatic standard calibration, a sensor is calibrated outside of its process environment, using a standard medium of known value against which the sensor reading is compared. For instance, a pH sensor can be calibrated against a standard solution of known pH, or a dissolved oxygen sensor can be calibrated against the oxygen in air. The expression ‘automatic’ signifies that ARC sensors have the ability (within certain limits) to recognize the standard into which they are placed, and to configure themselves appropriately for calibration against that standard. You can see a list of standards appropriate for use with ARC sensors on Table 2.2, *Sensor calibration standards*, on Page 42.

With product calibration, a sensor is calibrated within its process environment. In this case, a sensor reading is taken at the same time a sample is taken from the process. The sample is analyzed offline in the laboratory, and the offline result used to correct the sensor reading.

NOTE: With the HAMILTON ARC system, only the primary parameter of a sensor can be calibrated (dissolved oxygen for a DO sensor, conductivity for a Cond sensor, pH for a pH sensor). Temperature is the secondary parameter in every ARC sensor, and cannot be calibrated.

Section 1.5.4.2 Calibration theory

Calibration of dissolved oxygen and pH ARC sensors takes place at two calibration points. Calibration of conductivity ARC sensors takes place at just one point. During calibration at each point, sensors are exposed to a defined and strictly-controlled environment, and their readings compensated against the known conditions of that environment. For example, the VISIFERM DO ARC sensor is calibrated:

- In an environment of 0% oxygen at its first calibration point.
- In an environment of atmospheric oxygen at its second calibration point.

This is shown in Figure 1.8. Here, the two calibration points are used to define a calibration curve to map the luminescence phase shift (the raw measurement underlying the sensor's primary parameter) against the stated primary parameter, namely, dissolved oxygen.

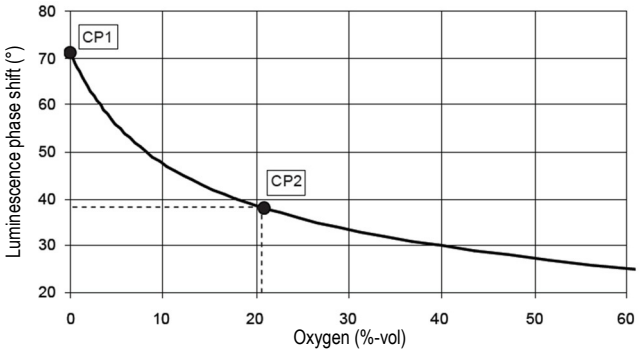


Figure 1.8 Calibration of the primary parameter at two points using a VISIFERM DO ARC sensor

This curve is then used to interpret luminescence phase shift values during sensor operation, to give accurate dissolved oxygen measurements.

At each calibration point, the calibration process is as follows:

1. The Handheld sends the calibration command to the ARC Sensor.
2. The sensor software analyzes the measurement data stored in its internal memory over the past three minutes, and if the criteria for signal stability, calibration range and temperature are met, the calibration values for this calibration point are calculated and immediately made active.
3. If the measurement values are drifting or the standard is not recognized, several attempts for calibration will be made automatically for at most 180 seconds.
4. As soon as the measurement values are stable, the sensor will proceed as described in point 2.
5. If the calibration is not successful during the 180 seconds, the calibration procedure will be cancelled.

NOTE:
- If calibration fails at one of the calibration points, the sensor can still be used. However, the measured value can be compromised. Measurement reliability is expressed as the `Quality indicator` field in `[Sensor]` → `View` → `Sensor status`.
- If the sensor does not recognize the standard for at most 180 seconds after initiating the calibration, calibration will be cancelled automatically with a corresponding warning message.
- If the measurement values are not stable for at most 180 seconds after initiating the calibration, calibration will be cancelled automatically with a corresponding warning message.
- If calibration fails, a warning message is displayed. For more information, see Section 4.4.3, *Calibration status messages*, on Page 128.

Section 1.5.5 ARC sensors: digital interface configuration

Section 1.5.5.1 Introduction

Configuration of an ARC sensor digital interface is quite simple. There are only two parameters:

- Modbus device address
- Baud rate

NOTE: Specialists configure the digital interface on screens accessed from `[Sensor]` → `Tools` → `Interface configuration` → `Digital RS485`.

Section 1.5.5.2 Modbus device addresses

Background

Modbus is a digital serial communications protocol published by Modicon for use with its programmable logic controllers (PLCs). It has become a standard communications protocol, and is now a commonly available means of connecting industrial electronic devices.

Modbus allows for communication between many devices connected to the same network, for example, a system that measures temperature and humidity and communicates the results to a computer.

HAMILTON uses a Modbus protocol in which there is one master device (the PLC or ARC View Handheld) and numerous passive slave devices (the sensors). The master device transmits a Modbus device address to establish a communications link with a sensor. All sensors that do not have this address ignore the transmission.

The HAMILTON Modbus protocol is described in detail in the *VISIFERM*™ *DO Modbus RTU Programmer's Manual*, PN 624179. See also Appendix A.5, *HAMILTON ARC System documents*, on Page 137.

Modbus device addresses and sensors

An ARC sensor's Modbus device address uniquely identifies an ARC sensor with respect to its digital communications with the PLC. The address is represented by a number in the range 1 to 30.

NOTE: Do not confuse the Modbus device address of a sensor with its Sensor ID or Sensor Number. For more information about Sensor IDs or Sensor Numbers, see:
- Figure 1.2, *The ARC View Handheld showing top level of interface, pH sensor attached*.
- Table 1.1, *ARC View Handheld keys and interface*.

By default, every ARC sensor has a Modbus device address of 1. This is set at the factory during the sensor's production. Because of this, a new Modbus device address (in other words, not 1) must be configured for every ARC sensor that is added to an ARC System with a digital PLC, thereby making sure that every sensor in the System has a unique address. (If two sensors have the same address, then when the PLC transmits an address, only the quicker of the two sensors responds).

Section 1.5.5.3 Baud rates

The Baud rate affects the wired connection made by an ARC sensor's RS485 Modbus digital interface. It has no influence on the analog connection between a sensor and an analog PLC system. It is therefore only critical for wired connections between ARC sensors and digital PLC systems.

Naturally, higher Baud rates equate to quicker communications between sensors and other hardware. However, higher Baud rates can lead to unreliable connections in some instances. A typical example of this is a long cable connection between a sensor and a digital PLC system. It is not possible to be specific about cable lengths or to offer recommendations, because variables such as cable quality and local interference are as important as cable length.

If you have a digital PLC system, you must experiment to find the best combination of speed and reliability.

Section 1.5.6 ARC sensors: analog interface configuration

NOTE: Specialists configure the analog interface using screens accessed from `[Sensor]` → `Tools` → `Interface configuration`.

Section 1.5.6.1 Introduction

All ARC sensors have two analog interfaces (with the exception of the VISIFERM DO ARC, which has one). Normally, you use one analog interface for one measurement parameter. For example, by default, the Easyferm Plus sensor uses mA interface #1 for its primary parameter (pH) and mA interface #2 for its secondary parameter (temperature).

However, you do not have to keep the default settings. You might even want to configure the sensor's primary parameter so that it is output on both analog interfaces. You could then further configure each interface, for example, optimizing mA interface #1 for pH readings between pH 3 and pH 4, and optimizing mA interface #2 for readings between pH 6 and pH 7.

You can configure each of a sensor's analog interfaces independently.

NOTE: Analog interface configuration is for both of a sensor's parameters. Sensor calibration (for measurement accuracy) is for only a sensor's primary parameter. (See Section 1.5.4, *ARC sensors: two kinds of calibration*, on Page 23).

There are four aspects to configuring an analog interface:

- Selecting the interface/parameter combination. (Section 1.5.6.2, *Mapping sensor measurement parameters to analog interfaces*).
- Selecting the interface mode for the interface and parameter selected. (Section 1.5.6.3, *Configuring the mode of the analog interfaces*).
- Configuring the output current for the interface mode. (Section 1.5.6.4, *Configuring the output current of the analog interfaces*).
- Configuring errors and warnings for the interface mode. (Section 1.5.6.5, *Configuring errors and warnings*).

Section 1.5.6.2 Mapping sensor measurement parameters to analog interfaces

Introduction

Specialists must first define the interface/parameter combination to they will later configure. Remember that pH and conductivity sensors have two analog interfaces, but dissolved oxygen sensors, only one. This means that for pH and conductivity sensors, there are two interface/parameter relationships to map.

Configuration

Specialists map parameters to interfaces by:

1. Selecting an analog interface.
   They do this on `[Sensor]` → `Tools` → `Interface configuration`.
2. Selecting the parameter they wish to map to the analog interface already selected.
   They do this with the `Measurement variable` field on `[Sensor]` → `Tools` → `Interface configuration` → `mA interface #1 [or #2, or mA/ECS-Interface]` → `Output current configuration`.

Section 1.5.6.3 Configuring the mode of the analog interfaces

Introduction

An analog interface can operate in one of three ways:

- Measurement:
  The output of the 4-20 mA interface is a function of the value of the measurement parameter mapped onto it.
- Test:
  The output of the 4-20 mA interface is a constant signal. This could be used, for example, for testing the 4-20 mA current loop.
- Switched off:
  The 4-20 mA interface gives no signal.

Configuration

In reality, choice of sensor analog interface mode requires that a number of further choices are made by the Specialist. These are discussed in Section 1.5.6.4.

Section 1.5.6.4 Configuring the output current of the analog interfaces

Introduction

Specialists can configure the way in which each analog interface of the sensor sends information to the PLC system. Specialists do this by defining the relationship between the value measured by the sensor (for instance, the pH 7), and the electric current transmitted to the PLC system (for instance, 10 mA).

NOTE: Specialists configure the analog interface output current starting on [Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Interface mode.

Configuration

In Section 1.5.6.3, the Specialist decided on the operation mode of the interface:

- Measurement.
- Test.
- Switched off.

If the Specialist is using the interface for *measurements*, he must now decide whether the relationship between the measured value and the output current is to be determined by two points as a straight-line graph, or by three points as a two-straight-line graph. These options are called 4–20 mA linear, and 4–20 mA interface bilinear, and are explained in Table 1.6, on Page 28.

If the Specialist wants to use the interface for test purposes, he requires 4–20 mA fixed. This is also shown in Table 1.6, on Page 28.

If the Specialists does not require the interface, he sets OFF.

If the Specialist wants to use the interface for measurement, he now configures values for the relationship (linear or bilinear) he has selected. If he is using a test mode, he defines a fixed value for the test mode.

NOTE: The Specialist configures values on [Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration.

The task of the Specialist is to configure the sensor signal sent to the analog PLC in a way that emphasizes the measurement range that is of most interest. For instance, if the pH in the process is always in the range pH 4 to pH 6, then the Specialist configures the signal for this range, and allows measurement values outside pH 4 to pH 6 to fall out of 4-20 mA range of the analog interface.

Mode	Explanation
OFF	The analog interface is switched off. No signals are sent.
4–20 mA fixed	The interface sends a continuous fixed signal for test purposes. **NOTE:** Specialists can configure this fixed test signal on [Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration.

Table 1.6 Explanation of interface modes configured on [Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Interface mode

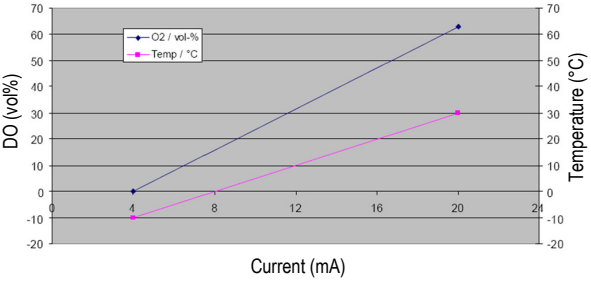
Mode	Explanation
4–20 mA linear	Configuration of the interface takes place using two points. In this kind of configuration, the two points become the ends of a straight-line graph that determines the relationship between: • The value measured by the sensor immersed in the process, for instance, the DO value. • The output of the 4-20 mA interface to the process control system.  The figure above shows two virtual straight-line graphs expressing the relationship between measurements on the VISIFERM DO ARC sensor, and interface's output current. The graphs are for dissolved oxygen and for temperature. (Both parameters cannot be mapped to the single analog interface at the same time.) **NOTE:** Specialists can enter a value for each end of the graph on `[Sensor]` → `Tools` → `Interface configuration` → `mA interface #1 [or #2, or mA/ECS-Interface]` → `Output current configuration`.

Table 1.6 Explanation of interface modes configured on `[Sensor]` → `Tools` → `Interface configuration` → `mA interface #1 [or #2, or mA/ECS-Interface]` → `Interface mode`

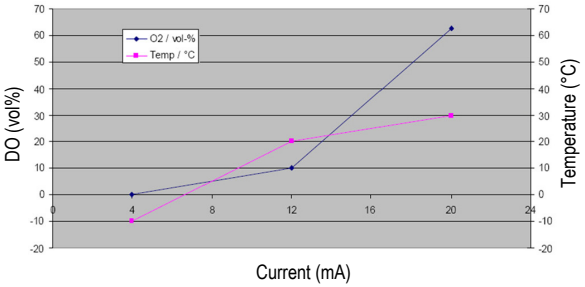
Mode	Explanation
4–20 mA bilinear	Configuration of the interface takes place using three points. In this kind of configuration, the three points define the two straight lines of a graph that determines the relationship between: • The value measured by the sensor immersed in the process, for instance, the DO value. • The output of the 4-20 mA interface to the process control system.  The figure above shows two graphs expressing the relationship between measurements on the VISIFERM DO ARC sensor, and the output current. **NOTE:** Specialists can enter a value for each end, and the center point of the graph on `[Sensor]` → `Tools` → `Interface configuration` → `mA interface #1 [or #2, or mA/ECS-Interface]` → `Output current configuration`.

Table 1.6 Explanation of interface modes configured on `[Sensor]` → `Tools` → `Interface configuration` → `mA interface #1 [or #2, or mA/ECS-Interface]` → `Interface mode`

Section 1.5.6.5 Configuring errors and warnings

Introduction

Specialists can configure the way in which the analog interfaces of the sensor electronically represent a warning or error status to the PLC system. In addition, Specialists can define the parameters for a warning or error status.

NOTE: Specialists configure errors and warnings on `[Sensor]` → `Tools` → `Interface configuration` → `mA interface #1 [or #2]` → `Error/warning configuration`.

Configuration

The range of parameters available for configuration depend on the sensor connected and the choices made in Section 1.5.6.3, *Configuring the mode of the analog interfaces*.

The complete list of fields is shown on [Sensor] → Tools → Interface configuration → mA interface #1 [or #2] → Error/warning configuration.

Section 1.5.7 ARC sensors: Cleanings and Sterilizations In Place

Cleanings In Place (CIPs) and Sterilizations In Place (SIPs) are both supported by the ARC System.

NOTE: All operators can see, and Specialists can configure, the definitions and total number of CIPs and SIPs for a sensor. They do this [Sensor] → Tools → Calibration → Calibration data.

As the name suggests, a CIP and SIP are the events in which a sensor is cleaned and sterilized without removing it from the process equipment. A typical definition for a CIP and a SIP are shown below:

	Temp Min	Temp Max	Time
CIP	80°C	100°C	30 min
SIP	120°C	130°C	30 min

Table 1.7 Typical CIP and SIP definitions

Every ARC sensor automatically counts the number of CIPs and SIPs it has undergone, and records the totals internally. Depending on whether an attempted CIP or SIP meets its target parameters, the sensor determines the attempted CIP or SIP to have taken place or not. Figure 1.9 shows sensor recordings for the CIPs and SIPs defined in Table 1.7.

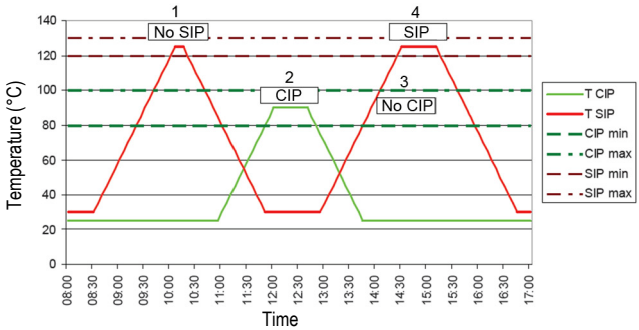


Figure 1.9 Technique for counting CIPs and SIPs in ARC sensors

- Case 1: The sensor does not record a SIP because the time duration was too short to meet the definition of a SIP shown in Table 1.7.

- Case 2: The sensor records a CIP because the time and temperature were in range.
- Case 3: The sensor does not record a CIP because the temperature continues to rise above the upper maximum for a CIP. Instead, the SIP at Point 4 is recorded.
- Case 4: The sensor records a SIP because the time and temperature were in range.

Both CIPs and SIPs are wearing the sensors, and are the main cause for the limited sensor life of sensors from all manufacturers. Typically, sensors can withstand 50 to 100 CIPs and SIPs, depending on the temperature and time duration of the events, and also depending on whether cleaning and sterilization agents are used.

With experience, operators can combine the information found on `[Sensor]` → `Tools` → `Measurement` → `CIP/SIP definition` about the number of CIPs and SIPs that a sensor has undergone, together with their knowledge of the kind of CIPs and SIPs used, to estimate the remaining life-span of their sensors.

Section 1.5.8 ARC sensor measurements: moving average

A moving average is a window during which a sensor looks backwards in time, averaging its latest reading within the window. The use of averaged readings can be preferable when real readings fluctuate greatly. This is because an averaged reading is a better indication of an underlying trend than are many, variable readings.

NOTE:
- A Specialist sets the moving average for a sensor on `[Sensor]` → `Tools` → `Measurement`.
- Do not confuse a reading (of which there can be many in a moving average) with the resolution value (VISIFERM DO ARC only). Resolution is explained in Section 1.5.9, *ARC sensor measurements: resolution*.
- Moving averages are explained in the *VISIFERM™ DO Modbus RTU Programmer's Manual*, PN 624179 and other documents in Appendix A.5, *HAMILTON ARC System documents*, on Page 137.

A moving average improves signal stability over the short term. However, the response time of the sensor increases (degrades) with the increased moving average. For example, VISIFERM DO ARC calculates a new oxygen reading every three seconds. You can smooth this reading by means of a moving average (Figure 1.10, on Page 33). However, a moving average applied to 20 three-second readings results in a response time of at least 60 seconds. The Specialist can set the number of readings in the moving average array between 1 and 16 (pH and conductivity sensors), or 1 and 30 (DO sensor), or can enter a value of zero (0) to activate the automatic mode, in which the sensor varies this setting depending on the measuring signal trend.

Section 1.5.9 ARC sensor measurements: resolution

With respect to ARC sensor measurements, the expression *resolution* refers to the number of sub-measurements underlying a recorded measurement made by the VISIFERM DO ARC sensor. The expression is not used with any other kind of sensor, and the `Resolution` field is only available on the Handheld for dissolved oxygen sensors.

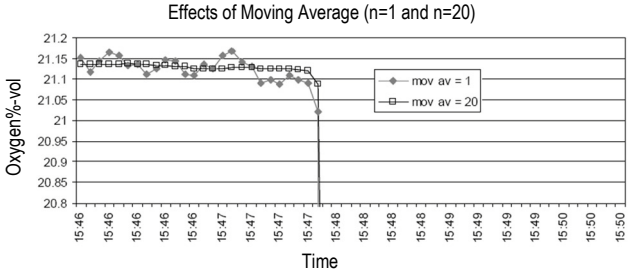


Figure 1.10 Comparison of the response of VISIFERM DO ARC to a change from air to nitrogen, using n=1 (no moving average) or a moving average of n=20

NOTE: The Specialist sets the resolution for a VISIFERM DO ARC sensor on `[Sensor]` → `Tools` → `Measurement`.

The measurement made by VISIFERM DO ARC in each 3-second interval is, in reality, the average of up to 16 sub-measurements (Figure 1.11, on Page 33). The Specialists can set the number of

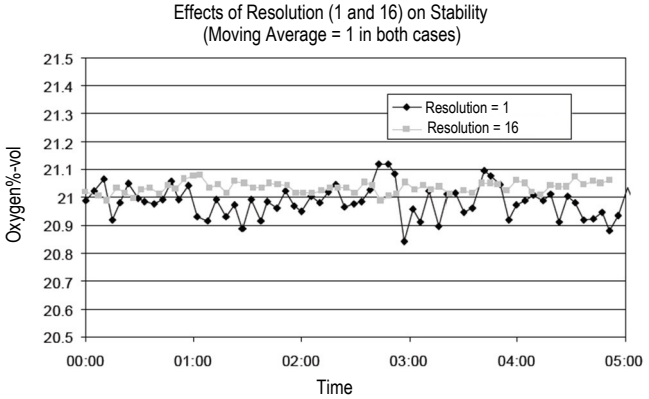


Figure 1.11 Comparison of signal stability of VISIFERM DO ARC when using a resolution of 1 and 16

sub-measurements between 1 and 16, or can enter a value of zero (0) to activate the automatic mode, in which the sensor varies this setting depending on the measuring signal trend.

The advantage of using a lower resolution is the shorter period of exposure of the luminophore to the excitation light. This reduces the photo bleaching of the luminophore and enhances its lifetime, and therefore the lifetime of the sensor. The advantage of using a higher resolution is enhanced signal quality.

Section 1.5.10 ARC sensor measurements: temperature compensation factor

With respect to ARC sensor measurements, the expression *temperature compensation factor* refers to an adjustment that an Specialist can make to compare the conductivity measurements at different temperatures. It provides an estimate of the sample's conductivity at a common reference temperature (25°C). The `Temp. comp. factor` field is available on the Handheld for conductivity sensors only.

NOTE: The Specialist sets the temperature compensation factor for a Conducell 4USF sensor on `[Sensor]` → `Tools` → `Measurement`.

The temperature compensation factor is the rate at which a solution's conductivity increases with an increase of temperature and is expressed as the percentage increase of conductivity for a temperature rise of 1 °C. The compensation factor chosen by the Specialist must be dependent on the liquid being monitored by the sensor.

Section 1.5.11 ARC sensor measurements: quality indicator

With respect to ARC sensor measurements, the expression *quality indicator* refers to an estimate made by the sensor of the reliability of its primary reading: conductivity, pH, or dissolved oxygen (not temperature, which is the secondary reading). The `Quality indicator` field is available for all ARC sensors and represents the sensor condition in six gradations: `Excellent, High, Acceptable, Poor, Very Poor, Defective.`

NOTE: All operators can see the Quality indicator for a measurement on `[Sensor]` → `View` → `Sensor status`.

The calculation of the quality indicator for a sensor takes into consideration a number of factors, some sensor-specific, and some general. Sensor-specific considerations include:

- Dissolved oxygen sensors: luminophore status is continuously monitored.
- pH sensors: 0 (zero) point position and slope of the pH calibration curve is checked following calibration.
- Conductivity sensors: Cell constant of the sensor is checked following calibration.

General considerations for the calculation of the quality indicator include:

- The quality of the most recent calibration.
  If a calibration fails at one of the calibration points and a calibration warning message is generated, this does not necessarily mean that the sensor cannot be used. In event of failure at a calibration point, the sensor uses its most recent successful calibration data, but the quality indicator can degrade.
- Because the accuracy and reliability of all sensors can decline with use:
  - The number of Cleanings In Place (CIPs) the sensor has undergone.
  - The number of Sterilizations In Place (SIPs) the sensor has undergone.
    (For more information about CIPs and SIPs, see Section 1.5.7, *ARC sensors: Cleanings and Sterilizations In Place*, on Page 31.)

- The number of operating hours at different temperatures.

(You can see these statistics on [Sensor] → View → Sensor status → Total operating hours).

Section 2 Handheld tasks tutorial

This section offers an introduction to the main tasks that operators—Users, Administrators, and Specialists—perform on a regular basis for a HAMILTON ARC System, using the HAMILTON ARC View Handheld.

Section 2.1 Introduction

This section guides you through some of the tasks that operators perform with the ARC System on a daily basis. Before starting this section, you must understand the different levels of access that Users, Administrators, and Specialists have to the ARC System. For more information, see Section 1.5.2, *ARC sensors: operator levels*, on Page 19.

Administrators and Specialists must enter a password to perform Administrator-level and Specialist-level tasks.

Section 2.2 User tasks

The User has the lowest level of access to the ARC System of all operator types: he or she can only check the status of the System, and read measurements made by sensors in the System.

Task 1 Checking the status of all sensors in the ARC system

Introduction

The Handheld can display data from only the four (or fewer) sensors that it actively monitors at any time. Data from each of these sensors is shown in a data-overview panel containing information about sensor type, parameters and values measured, and sensor status. If everything is functioning correctly, the status symbol is green. Flashing green indicates that the Handheld is being updated with data from a correctly-functioning sensor (Figure 2.1).

Status symbol in the sensor's data-overview panel. Here it is green, showing that the sensor is functioning correctly. Flashing green indicates data is updating.

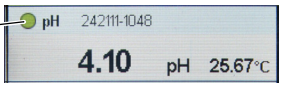


Figure 2.1 Status symbol of a sensor (top level of Handheld interface)

Actions

1. If necessary, switch on the Handheld by pressing the Left Key and Right Key together for three seconds.
2. If the Handheld is already switched on, press the Left Key until you reach the top level of the interface, where you see the data-overview panels. (Figure 1.2, *The ARC View Handheld showing top level of interface, pH sensor attached*, on Page 11).

3. Check the status of the sensors displayed on the top level of the interface. All status indicators for connected sensors must be green or yellow. (Figure 2.1.)
4. Use the Up Key and Down Key to scroll and check the status of any other sensors connected.
5. If a sensor has a yellow status indicator, you must read the associated warning or error message to find out why, and then correct the situation. You can find this information in Sub-Task 3.1, *Reading sensor status data*, on Page 39.

Comments

You can check the status of a sensor when the Handheld is in the Dock or out of the Dock.

When you scroll to see a sensor not currently displayed on the screen, you must wait for a new connection (wired or wireless) to establish itself between the sensor and the Handheld. This can take some time. (The connection between the sensor and Process Control System is not affected.)

Task 2 Reading basic parameter values from a sensor

Sub-Task 2.1 Reading basic parameter values in numeric form

You can read a sensor's parameter values in numeric form from the top level of the Handheld's interface, as mentioned in Task 1, *Checking the status of all sensors in the ARC system*.

Sub-Task 2.2 Reading basic parameter values in graphic form

Introduction

With the ARC View Handheld you can observe data trends over time periods, as well as real-time numeric values. To do this, you must open a graph, as explained in *Actions* immediately below.

Actions

1. Select the required sensor on the top level of the interface.
2. Click View → Graph → OK.
   A graph similar to Figure 2.2 appears.
3. Use the up and down arrow buttons to change the scale of the X-axis (zoom in and zoom out). Three scales are possible: 1 minute, 10 minutes and 100 minutes.

Comments

The graph begins to form as soon as the you click OK.

The details of the graph depend on the sensor type for which it is displaying data.

For the operator level S, additionally the name of a trace file is displayed in the screen title.

For information about trace files, see Task 5, *Managing trace files*, on Page 53.

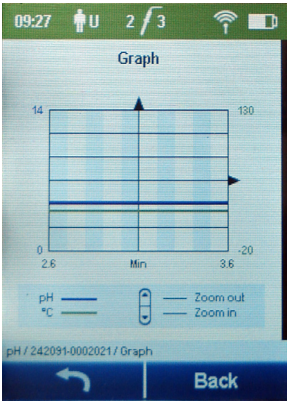


Figure 2.2 Graph for pH sensor as displayed after 3.6 minutes have elapsed in U or A mode.

Task 3 Reading detailed data from a sensor

Introduction

As well as being able to read measurements from a sensor, it is also possible to read a lot of other data, in addition. Categories available are:

- Sensor status.
  This has to do with sensor wear and the sensor's current performance.
- Sensor information.
  This has to do with sensor identification: part number, software version, and so on.
- Interface configuration.
  This has to do with the way in which the Specialist has set up the digital and analog interfaces of the sensor selected.

Sub-Task 3.1 Reading sensor status data

Introduction

There are five kinds of sensor status data:

- The total number of operating hours during the sensor's entire lifetime. These are broken down into sub-categories:
  - Above 85°C maximum measurement temperature.
  - Above 135°C maximum operating temperature.

  (Naturally, the sub-category for hours above 85°C also includes all hours above 135°C.)
- The number of Cleanings In Place and Sterilizations In Place that the sensor has undergone in its entire life.

- Warning messages associated with a sensor warning status.
- Error messages associated with a sensor error status.
- Quality indicator.

Actions

1. Select the required sensor on the top level of the interface.
2. Click View → Sensor status.

Sub-Task 3.2 Reading sensor information data

Introduction

The data you find is very much as you might expect: sensor name, part number, serial number, and so on. The data is of use in precisely identifying a particular sensor.

Actions

1. Select the required sensor on the top level of the interface.
2. Click View → Sensor info

Sub-Task 3.3 Reading interface configuration data

All HAMILTON ARC sensors have two analog interfaces with the exception of the VISIFERM DO ARC dissolved oxygen sensor, which has only one analog interface (and the standard ARC digital interface).

It is the task of a Specialist to configure these interfaces appropriately for the process control system. As a User, you cannot make any changes.

Actions

1. Select the required sensor on the top level of the interface.
2. Click View → Interface configuration.

Section 2.3 Administrator tasks

The HAMILTON ARC System supports three kinds of operator: User, Administrator, and Specialist. To read more about this, see Section 1.5.2, *ARC sensors: operator levels*, on Page 19.

In addition to his own tasks, the Administrator can perform all User tasks.

NOTE: Be sure you are familiar with User tasks before continuing in this section. (See Section 2.2, *User tasks*, on Page 37.)

Task 1 Setting the Administrator operator level

Introduction

To be able to perform Administrator tasks, an operator must first enter the Administrator password. This is explained immediately below.

Actions

1. If necessary, switch on the Handheld by pressing the Left Key and Right Key together for three seconds.
2. If the Handheld is already switched on, press the Left Key until you reach the top level of the interface, where you see the data-overview panels. (Figure 1.2, *The ARC View Handheld showing top level of interface, pH sensor attached*, on Page 11.)
3. Select the sensor with which you want to work.
4. Click `Tools`.
5. Select `A` for Administrator.
6. Click `OK`, and enter the following password:
   `18111978`

NOTE:
- The password shown above is the factory default for the Administrator. This password can be changed using the *ARC Sensor Configurator* freeware.
- Every time the Handheld switches off automatically or is switched off manually, and every time an operator moves to the top level of the Handheld interface, the sensor defaults to the User operating mode.
  However, if when moving to the top level of the interface, the operator explicitly confirms that he or she wants to keep the password he or she has already entered, then the Handheld remembers the password. In this case, when the user clicks `Tools` to access functions that are password protected, he or she must only confirm (not re-enter) that password.

Task 2 Calibrating a sensor

Introduction

When you calibrate a sensor, you calibrate the sensor's primary measurement parameter (dissolved oxygen, conductivity, or pH). You cannot calibrate the sensor's secondary measurement parameter, temperature.

Automatic standard calibration

Automatic standard calibration is a two-stage procedure for pH and dissolved oxygen (DO) sensors, and a one-stage procedure for conductivity sensors.

Sensor	Calibration Requirements
pH	Apply suitable standard pH solution at calibration point 1. Apply suitable standard pH solution at calibration point 2.
Dissolved oxygen (DO)	Apply suitable oxygen level (zero oxygen, often a nitrogen atmosphere) at calibration point 1. Apply suitable oxygen level (ambient air) at calibration point 2.
Conductivity	Apply suitable standard calibration solution at single calibration point.

Table 2.1 Sensor calibration requirements

HAMILTON ARC pH and conductivity sensors have an auto-calibrate function, by which they automatically recognize the calibration standard in which they are immersed. This means that you can choose from a range of standards from a range of manufacturers, and the sensor automatically calibrates appropriately.

Sensor type	Calibration standards
pH	• HAMILTON • MERCK TITRISOL • DIN 19267 • NIST STANDARD • METTLER TOLEDO • RADIOMETER
Dissolved oxygen (DO)	Commercial standard not required. See Table 2.1.
Conductivity	• HAMILTON • REAGECON • KCl solutions

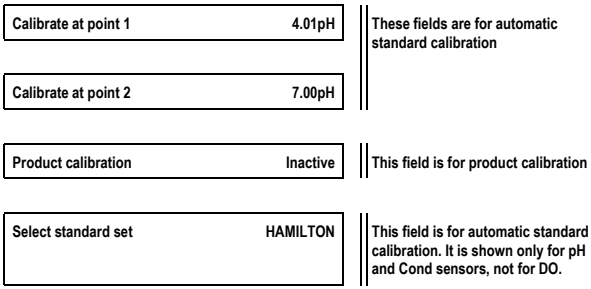
Table 2.2 Sensor calibration standards

However, while standards from different manufacturers are often similar enough for the sensor to make a correct general identification, standards differ in details, notably temperature dependency. For this reason, for optimal accuracy when performing pH and conductivity measurements, you must enter the name of the standards set that you are using. The list of manufacturers from which calibration sets can be used is stored within each sensor, and so can change with sensor type, model, and revision.

NOTE: You can find more sensor-specific information in the documentation that accompanies your ARC sensors.

Actions

1. Select the required sensor on the top level of the Handheld's interface.
2. Enter the Administrator password as described in Task 1, *Setting the Administrator operator level*, on Page 41.
3. Go to `[Sensor]` → `Tools` → `Calibration` → `Calibrate`
   You see a screen showing, at the top, the two points for automatic standard calibration (for conductivity sensors, only one point), together with the corresponding values for the calibration standards used at the last successful calibration event. For example, for the pH sensor, you might see:



   At the bottom, you see the calibration standards set currently selected. In this example, it is HAMILTON. The standards selected determine the values shown for point 1 and 2 of the calibration above.
4. Check that the appropriate set of calibration standards is selected. Click `OK` to make a new selection if necessary.
   The list of calibration sets available depends on the sensor you are using, and can change with different sensors.
5. Apply the correct conditions (oxygen level or standard) to the sensor for calibration at point 1.
6. Click `Calibrate at point 1`.
   The first stage of the calibration takes place.
7. Apply the correct conditions (oxygen level or standard) to the sensor for calibration at point 2.
8. Click `Calibrate at point 2`.
   The second stage of the calibration takes place.

The calibration will be cancelled under the following conditions with a corresponding warning message:

- If the sensor does not recognize the standard for at most 180 seconds after initiating calibration.
- If the measurement values are not stable for at most 180 seconds after initiating calibration.

NOTE: If calibration fails at one of the calibration points, this does not mean that the sensor cannot be used. In event of failure at a calibration point, the sensor uses its most recent successful calibration data for that point. However, this means that the reliability of measurement can be compromised. Reliability of measurement is expressed as the quality indicator in Screen 20, `[Sensor]` → `View` → `Sensor status`.
If calibration fails, a warning message is displayed. For more information, see Section 4.4.3, *Calibration status messages*, on Page 128.

Product calibration

Product calibration takes place not with the sensor immersed in a standard, but with the sensor immersed in the product it is measuring. This means that product calibration is an in-process calibration that takes place without the sensor having to be removed from the process and placed in a laboratory.

Product calibration is a calibration procedure that you can perform in addition to an automatic standard calibration. Product calibration adapts the calibration curve produced by the automatic standard calibration to the process conditions in force at the time of the product calibration (technical details are given in the sensor programmer's manuals listed in Appendix A.5). This means that you should always perform an automatic standard calibration, to create an optimal standard calibration curve, before performing a product calibration.

The outline procedure for product calibration is as follows:

1. A measurement is performed with the sensor in the process, in the product being measured. This is referred to as the initial measurement.
2. A sample is taken from the product in the process.
3. The sample is measured in the laboratory for the appropriate parameter (dissolved oxygen, pH, or conductivity).
4. The laboratory measurement is assigned to the sensor, thereby creating an offset to the automatic standard calibration.

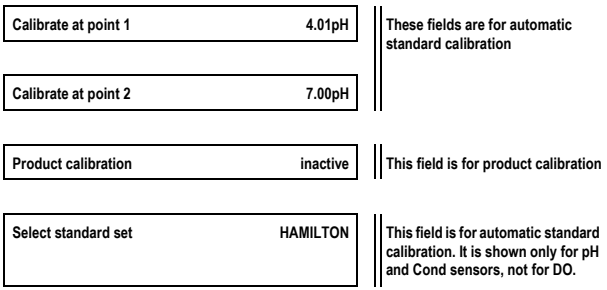
NOTE:
- You can cancel a product calibration at any time. If you do this, the underlying automatic standard calibration becomes active.
- A new automatic standard calibration overwrites and cancels a product calibration.

Actions

NOTE: If you have not done so recently, perform an automatic standard calibration, as described in *Automatic standard calibration*, on Page 42.

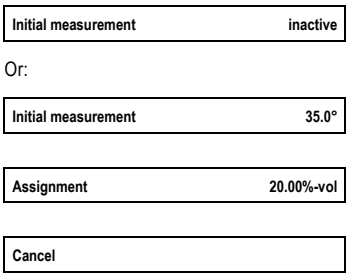
1. Select the required sensor on the top level of the Handheld's interface.
2. Enter the Administrator password as described in Task 1, *Setting the Administrator operator level*, on Page 41.
3. Go to `[Sensor]` → `Tools` → `Calibration` → `Calibrate`.

You see a screen showing at the top the two points already used for automatic standard calibration (for conductivity sensors, only one point). For example, for the pH sensor, you might see:



At the bottom, you see the manufacturer of the calibration standards set used for the last automatic standard calibration. In this example, it is HAMILTON.

4. Select `Product calibration` and click OK.
   You see a screen (`[Sensor]` → `Tools` → `Calibration` → `Calibrate` → `Product calibration`) similar to one of the following



Or:

(Note that the units and values that you see on this screen are sensor dependent.)

5. Whichever of the two versions of the screen you see, perform the following two actions as closely together in time as possible:
   - Select `Initial measurement` and click OK. This records the current measurement of the selected sensor in the memory of the sensor.
     (Note, however, that it is not the value for the named primary parameter (pH, conductivity, dissolved oxygen) that is held in memory: it is the underlying raw measurement from which the named parameter is derived.)
   - Take a sample of the product in the process.
6. Perform a laboratory measurement on the sample for the appropriate parameter (dissolved oxygen, pH, or conductivity).
7. Select `Assignment` and click OK. Assign the laboratory value for the primary parameter (dissolved oxygen, pH, or conductivity, depending on the sensor) to the value for the `Initial measurement`.

Product calibration is now active. This means that the value of the primary parameter now displayed on the Handheld for the sensor is continuously adjusted for greater accuracy with respect to the conditions of the process in which it was calibrated.

Section 2.4 Specialist tasks

As you know, the HAMILTON ARC System supports three kinds of operator: User, Administrator, and Specialist. Of these, the Specialist has the highest level of access. (If more information is required, read Section 1.5.2, *ARC sensors: operator levels*, on Page 19.)

In addition to his own tasks, the Specialist can perform:

- All User tasks.
- All Administrator tasks.

NOTE: Be sure you are familiar with User and Administrator tasks before continuing in this section. (See Section 2.2, *User tasks*, on Page 37, and Section 2.3, *Administrator tasks*, on Page 40.)

Task 1 Setting the Specialist operator level

Introduction

To be able to perform Specialist tasks, an operator must first enter the Specialist password. This is explained in *Actions* immediately below.

Actions

1. If necessary, switch on the Handheld by pressing the Left Key and Right Key together for three seconds.
2. If the Handheld is already switched on, press the Left Key until you reach the top level of the interface, where you see the data-overview panels. (Figure 1.2, *The ARC View Handheld showing top level of interface, pH sensor attached*, on Page 11.)
3. Select the sensor with which you want to work.
4. Click `Tools`.
5. Select `S` for Specialist.
6. Click `OK`, and enter the following password:
   `16021966`

NOTE:
- The password shown above is the factory default for the Specialist. This password can be changed using the *ARC Sensor Configurator* freeware.
- Every time the Handheld switches off automatically or is switched off manually, and every time an operator moves to the top level of the Handheld interface, the sensor defaults to the User operating mode.
  However, if when moving to the top level of the interface, the operator explicitly confirms that he or she wants to keep the password he or she has already entered, then the Handheld remembers the password. In this case, when the

user clicks Tools to access functions that are password protected, he or she must only confirm (not re-enter) that password.

Task 2 Managing Handheld settings

Introduction

Adjusting Handheld settings is not a regular task. Of the settings listed here, it is necessary only to set the date and time, and to do that only with a new Handheld, when settings drift over time, or if there is a new battery fitted in the Handheld.

This task contains the following sub-tasks:

- Sub-Task 2.1, *Adjusting date and time settings* (necessary on occasion)
- Sub-Task 2.2, *Configuring screen and Handheld power settings* (optional)
- Sub-Task 2.3, *Configuring ARC Handheld wireless settings* (optional)

Sub-Task 2.1 Adjusting date and time settings

Introduction

The ARC Handheld displays the current time on the top left of its display (Figure 1.2, on Page 11). Although the Handheld does not display the current date, the date is used for STA files created by the ARC System (Task 4, *Managing sensor STAtus profiles*, on Page 51).

Actions

1. Select the ARC View Handheld panel on the top level of the Handheld's interface. (This is shown on Figure 1.2, on Page 11.)
2. Click Tools.
3. Enter the Specialist password as described in step 5 of Task 1, *Setting the Administrator operator level*, on Page 41.
4. Select Settings, and click OK.
5. Select Set time, and click OK.
   Set the time.
6. Select Set date, and click OK.
   Set the date.

NOTE: The time is displayed in 24-hour format. The date is displayed as DD-MM-YYYY. You cannot change these display formats.

Sub-Task 2.2 Configuring screen and Handheld power settings

Introduction

By default, the ARC Handheld switches off its screen after 5 minutes of no activity (after 5 minutes in which no manipulation of the Handheld takes place). Pressing any key switches the screen on again.

Similarly, by default, the ARC Handheld switches itself off completely after 20 minutes of no activity. You can switch it on in the normal way, by pressing the Left Key and the Right Key simultaneously for 3 seconds.

For both screen and Handheld automatic switch-off, you can configure the default switch-off times from 1 minute to infinity (never switch off) as documented below.

NOTE:
- Screen switch-off does not switch off the Handheld or cause monitoring of sensors to stop. It only switches off the display.
- With both screen and Handheld switch-off settings, automatic switch-off takes place whether or not the Handheld is in the Dock.

Actions

1. Select the ARC View Handheld panel on the top level of the Handheld's interface. (This is shown on Figure 1.2, on Page 11.)
2. Click `Tools`.
3. Enter the Specialist password as described in step 5 of Task 1, *Setting the Administrator operator level*, on Page 41.
4. Select `Settings`, and click `OK`.
5. Select `Display settings`, and click `OK`.
   Set the length of time you want the screen to remain switched on. There are three options:
   - Enter the time in minutes.
   - Enter `000` if you want the screen to never switch off automatically.
6. Select `Power settings`, and click `OK`.
   Set the power settings as you did the display settings.

Sub-Task 2.3 Configuring ARC Handheld wireless settings

Introduction

ARC Handheld wireless settings govern wireless communication between the ARC Wi Sensor Adapter fitted to ARC sensors, and the ARC RF module in the Handheld.

ARC Handheld wireless settings have two configurations: `Auto`, and `Always ON`.

`Auto` is the default configuration: the handheld communicates over wire alone when placed in the Dock, and automatically switches to wireless mode when the Handheld is not in the Dock.

The alternative configuration is `Always ON`: wireless communication is always on, whether the Handheld is in the Dock or not. There can therefore be wireless communication with up to 30 sensors at all times, instead of wired communication with only one single sensor. Furthermore, the Handheld battery charges when in the Dock.

However, wired communication is not possible when `Always ON` is set. This means that any sensor connected by wire is not seen by the Handheld when it is on its Dock.

When the Handheld is switched off, it always resets to the default setting, `Auto`. To set `Always ON`, follow the instructions in *Actions* immediately below.

Actions

1. Select the ARC View Handheld panel on the top level of the Handheld's interface. (This is shown on Figure 1.2, on Page 11.)
2. Click `Tools`.
3. Enter the Specialist password as described in step 5 of Task 1, *Setting the Administrator operator level*, on Page 41.
4. Select `Settings`, and click `OK`.
5. Select `Wireless settings`, and click `OK`.
   Select `Auto` or `Always ON`.

Task 3 Setting up a new sensor in an ARC system

As a Specialist, your job includes setting up and configuring elements of the ARC System. The most common task is adding or exchanging a sensor. This breaks down into the following sub-tasks:

- Sub-Task 3.1, *Entering the Sensor ID*
- Sub-Task 3.2, *Configuring the Modbus device address*
- Sub-Task 3.3, *Configuring the Baud rate*
- Sub-Task 3.4, *Configuring the analog interface*
- Sub-Task 3.5, *Configuring a calibration*

Sub-Task 3.1 Entering the Sensor ID

NOTE:
- This sub-task is recommended when you add an ARC sensor to an ARC System.
- This sub-task concerns only the sensor's digital interface.

Every sensor in an ARC System has a number of identifiers. These include:

- The product name, for instance VISIFERM DO ARC.
- The firmware version of the code included in the sensor.
- The sensor's part number.
- The sensor's serial number.
- The sensor's Modbus device address.

All operators can see these fields on `[Sensor]` → `View` → `Sensor info`.

Most of these identifiers are set in the factory, and cannot be changed. However, Specialists can change the Sensor ID. By default, this string contains the sensor's part number followed by the sensor's serial number. It is often helpful to enter a string in this field that uniquely identifies the sensor in the context of your ARC System environment. For example, the string `Process C3` might enable other operators to quickly identify the sensor within your process environment.

NOTE: The Sensor ID is held in memory in the sensor. Every time you exchange a sensor for a new one, always check the ID Sensor string in the new sensor.

Specialists can change the Sensor ID on [Sensor] → Tools → Sensor info.

Sub-Task 3.2 Configuring the Modbus device address

NOTE:
- This sub-task is mandatory when you add an ARC sensor to a digital PLC system.
- This sub-task concerns only the sensor's digital interface.

An ARC sensor's Modbus device address uniquely identifies an ARC sensor within a group of ARC sensors with respect to its digital communications with a digital PLC system. (However, it has no effect on communications with the ARC View Handheld, or with the connection to the 4-20 mA analog interface.)

It is recommended that every sensor in an ARC System have a unique Modbus device address. You can read more about Modbus device addresses in Section 1.5.5.2, *Modbus device addresses*, on Page 25.

Specialists can change the Modbus device address for a sensor on [Sensor] → Tools → Interface configuration → Digital RS485.

Sub-Task 3.3 Configuring the Baud rate

NOTE:
- This sub-task is recommended when you add an ARC sensor to a digital PLC system.
- This sub-task concerns only the sensor's digital interface.

The Baud rate affects the wired connection made by an ARC sensor's RS 485 Modbus digital interface. It has no influence on either wireless or analog connection of a sensor.

You can read more about Baud rates in Section 1.5.5.3, *Baud rates*, on Page 26.

You can find information about setting the Baud rate for a sensor on [Sensor] → Tools → Interface configuration → Digital RS485.

Sub-Task 3.4 Configuring the analog interface

NOTE:
- This sub-task is necessary when the sensor is connected to an analog PLC system.
- This sub-task concerns only the sensor's analog interface or interfaces.

By configuring the ARC sensor's analog interface, you make it able to map a measured value to the 4-20 mA standard interface. Configuration options for the analog interface are quite extensive, and are explained in detail in Section 1.5.6.3, *Configuring the mode of the analog interfaces*.

NOTE: If you are not using an analog connection it is recommended you switch off the analog interface.

Specialists can configure the analog interface of a sensor in [Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface].

Sub-Task 3.5 Configuring a calibration

The ARC System makes use of an automatic standard calibration process (Section 1.5.4, *ARC sensors: two kinds of calibration*) in which each ARC sensor does the following:

1. Takes a reading (pH, conductivity, dissolved oxygen) from the standard in which it is placed.
2. Performs a simple recognition procedure in which the reading taken is compared to each standard within a given set of calibration standards (HAMILTON by default). The result is the precise identification of the standard in which the sensor is placed.
3. Automatically adjusts its reading to exactly match the known value of the standard identified.

With the ARC automatic standard calibration process, all required calibration data (for example, temperature-dependent values) for a wide range of standards from many manufacturers are encoded in each ARC sensor during its manufacture. This means that there is no need for operators to manually configure any details for automatic standard calibrations.

Nevertheless, the ARC system offers the following configuration options for calibration:

- Specialists can select the standards set from which the ARC sensor identifies the standard in which it is placed. They do this in `[Sensor]` → `Tools` → `Calibration` → `Calibrate`.
  (The HAMILTON set of calibration standards is set as the factory default for all ARC sensors. However, Specialists can select any set encoded in the sensor.)
- Using the *ARC Sensor Configurator* freeware, operators can review and redefine the standards included in the standards sets encoded in ARC sensors.

Task 4 Managing sensor STAtus profiles

NOTE: This task is normally necessary only for troubleshooting and quality management.

Introduction

A sensor STAtus profile (STA) is a listing of all information about a sensor. Naturally, the contents of such a profile depend on the type of sensor. However, for all sensors, three categories of information are included:

- Permanent information (serial number, product information).
- Temporary information (firmware version, interface configuration, measurement settings).
- 'Snapshot' information of the status of the sensor at the time the profile was created (error, warning).

Sensor STAtus profiles can be useful for quality management, and for troubleshooting with the help of HAMILTON technical support staff.

Sub-Task 4.1 Creating a sensor STAtus profile file

Introduction

You create a sensor STAtus (STA) profile file by copying information from a sensor to the Handheld. This creates a file that is held in memory in the Handheld. To do this, the sensor from which you wish to copy data must be connected to the Handheld in either wired or wireless mode.

There is space for 16 STA files on the Handheld. If you generate a 17th STA file, the first is automatically deleted. (This can be thought of as a file stack based on the 'first in, first out' principle.)

File name: STAxxxxx.txt, with xxxxx being a sequential number that serves to identify a file.

The typical size of STA files is 30 to 50 KB.

Actions

1. Select the sensor for which you want to make an STA file on the top level of the user interface, as shown in Figure 1.2, *The ARC View Handheld showing top level of interface, pH sensor attached*, on Page 11.
2. Enter the Specialist operator level as explained in Task 1, *Setting the Specialist operator level*, on Page 46.
3. Go to `[Sensor]` → `Tools` → `Data management`.
4. Select `Data transfer (Sensor to ARC View)`, and click `OK`.
   An intermediary screen opens, with `Sensor status profile` selected.
5. Click `OK`.
   An STA file is created in the memory of the Handheld. Status screens keep you informed of progress.

Sub-Task 4.2 Downloading a sensor STAtus profile

Introduction

You now have one or more sensor STAtus profile (STA) files in the memory of the Handheld. Next, you must copy at least one of them to a USB memory stick.

Actions

1. Make sure that the Handheld is in its Dock, and that a memory stick is also inserted into its socket in the Dock.
2. Go to `ARC View Handheld` → `Tools` → `Data management` → `Data transfer (ARC View to USB device)`.
   An intermediary screen opens, with `Sensor status profile` selected.
3. Click `OK`.
   A second intermediary screen opens displaying a list of available STA files.
4. Select the file you wish to download to the memory stick inserted in the Dock, and click `OK`.

5. A final intermediary screen opens, giving a brief overview of the file you have selected. Click OK to download the file to the memory stick, or, if you have selected the wrong file, click the Left Key to return to the list, and reselect.

Sub-Task 4.3 Reading a sensor STAtus profile file

Reading a sensor STAtus profile (STA) file is easy: you can view or print it from any application that can display ASCII text (Excel is ideal, but Notepad or MS Word also work well).

For details of the fields in the STA file, see Appendix C, *Sensor STAtus profile*.

Task 5 Managing trace files

Sub-Task 5.1 Creating a trace file

With ARC View Handheld, you can record the measurement data of a single sensor in a trace file.

Whenever you view the screen Graph/data log in Specialist mode ([Sensor] → Tools → Measurement → Graph/data log), a trace file will be created. The name of the file will be displayed in the title, with the name DATxxxxx.txt (xxxxx is a sequential number). As soon as you leave the Graph/data log screen, the data recording will be stopped. When you access the screen again, a new trace file will be created.

If the communication to the sensor is interrupted, the data points of the graph will display the last valid measurement values in red. In the trace file, only the time stamps for the measurement values will be recorded, but no sensor measurement values.

NOTE: While data logging is active, the Handheld will not be turned off automatically. Only the display will be disabled in case of inactivity.

NOTE: If the memory of the Handheld is full, the oldest file will be overwritten by the new one. ARC View Handheld can store at most 16 files per file type. Maximum size for a single file is 256 kb, this corresponds to 8.3 hours of measurement data recording.

Sub-Task 5.2 Downloading a trace file

1. Place the Handheld on the ARC View Dock, and connect an USB memory stick to the Dock.
2. Turn on the Handeld, if it is not already turned on. Go to ARC View Handheld → Tools → Data management → Data transfer (ARC View to USB device). Select Graph/Data log. A list of available trace files will be displayed.
3. Select a file, and click OK. You will reach a screen with information about the file. Click OK again, and the selected file will be downloaded to the memory stick.
4. Connect the memory stick to a computer.
5. You can now open the file with a texteditor or table editor.

Sub-Task 5.3 Interpreting a trace file

Characteristics of a trace file:

- File name: DATxxxxx.txt, with xxxxx being a sequential number that serves to identify a file.

NOTE: If there are files created from various Handhelds, there may be several with the same names.

- File properties: Standard ASCII text file, text blocks separated by tabs.

Example trace file

```
*** Measurement data log file ***
Filename: DAT00001

ARC VIEW H
Part number             242128/03
Serial number           000100
RF address              59568134
Firmware version        VIHMS024
Date Time               2010-11-31 14:24

ARC Wi sensor adapter
Part number             242170/00
Serial number           0327646
RF address              59560146
Firmware version        WI0MS006

Sensor info
Firmware version user   EPHUM011
end
Firmware date user end  2010-04-23
Productname             Polilyte Plus
Part number             242111/00
Workorder number        1388539
Workorder date          2010-02-22
Serial number           1201
Sensor ID               EPH02

Date Time               pH / pH                 T / °C
2010-11-31 14:24:05      6.191                  26.410
2010-11-31 14:24:09      6.191                  26.410
2010-11-31 14:24:13      6.191                  26.410
2010-11-31 14:24:17      6.191                  26.410
2010-11-31 14:24:21      6.191                  26.410
2010-11-31 14:24:25      6.191                  26.411
2010-11-31 14:24:29      6.191                  26.411
2010-11-31 14:24:33      6.191                  26.411
2010-11-31 14:24:37      6.191                  26.410
2010-11-31 14:24:41      6.191                  26.411
2010-11-31 14:24:45      6.191                  26.411
```

Table 2.3 Example of a trace file: ASCII text imported into a text publishing software and converted into a table. It contains the file name in the title, sensor information in the header and measurement data with time stamps in the body.

Task 6 Managing Sensor Configuration Files

Introduction

Sensor Configuration Files are sequential scripts of sensor commands used by ARC View Handheld to configure sensors. They can be programmed manually at a Computer, copied to a Handheld and from there to a specific sensor, or they can be generated directly from the configuration of an existing sensor.

NOTE: Sensor Configuration Files are a powerful tool. Erroneous use may lead to corrupted sensor configuration and malfunction in the application. Thoroughly check newly configured sensors before using them in your application! If they do not work as intended, review and correct the complete sensor configuration manually.

NOTE: The name of the Sensor Configuration File must have the file extension .pro, and it must consist of exactly eight (8) numbers and letters excluding the extension.

Sub-Task 6.1 Creating a Sensor Configuration File from a sensor

1. Got to `[Sensor]` → `Tools` → `Data management` → `Data transfer (Sensor to ARC View)` → `Sensor configuration`, and click `OK`.
2. ARC View Handheld will generate and store the Sensor Configuration File in its internal memory.
3. If you want to download the Sensor Configuration File to a computer, go to `ARC View Handheld` → `Tools` → `Data management` → `Data transfer (ARC View to USB device)`. Select `Sensor configuration` and click `OK`. Select one of the listed files and click `OK` to download it to the memory stick.

NOTE: If you create a Sensor Configuration File from an existing sensor, the device address, baud rate and passwords will not be included.

Sub-Task 6.2 Manually creating a Sensor Configuration File using a computer

NOTE: Only work with Sensor Configuration Files after you have made yourself familiar with the syntax. You will find information about the sensor functionality and command structure in the ARC Programmer's Manuals of the respective ARC sensors. See Appendix A.5, *HAMILTON ARC System documents*, on Page 137, for documents with information about the sensor specific programming options.

Create the Sensor Configuration File with a text editor as plain text ASCII file. The name of the Sensor Configuration File must have the file extension .pro, and it must consist of exactly eight (8) numbers or letters excluding the extension.

Structure of the Sensor Configuration File

- General criteria
  - Data fields are separated by semicolons ;
  - Contains a header with compatibility criteria
  - Contains a command section with the commands applied to the sensor
- Header
  - Must contain a line defining the HAMILTON part numbers of the sensors for which the Configuration File is valid. It must start with the keyword PART.
    Example: PART;242450-01;242452-02;242453-01
  - Can contain a line defining the firmware versions for which the Configuration File is valid. It must start with the keyword FIRMWARE.
    Example: FIRMWARE;ODOUM038;ODOUM037

- Can contain a line defining the Sensor IDs for which the Configuration File is valid. It must start with the keyword SENSOR.
  Example: SENSOR;DO123;DO124;DO125
- Can contain a line defining the operators who can apply a Configuration File to a sensor. It must start with the keyword OPERATOR.
  Example: OPERATOR;S. In this case, a Configuration File can only be applied by operators with the S level.
  This line is only relevant if the file contains commands that are normally reserved to the operator level D.

- Command section: Consists of command lines, which contain in sequential order:
  - Keyword REGISTER, mandatory
  - Modbus register address, mandatory
  - Number of the defined registers, mandatory
  - Data type(s) of the defined registers, separated by spaces, mandatory (see below Table 2.4 for data types)
  - Values of the defined registers, separated by spaces, mandatory
  - Comment, optional

Data type	Symbol
Unsigned integer (32 bit)	I
Floating point (32 bit)	F
Hex (32 bit)	H
Text character	T

Table 2.4 Defined data types

NOTE: You can include all functions described in the ARC Programmer's Manuals for programming a Sensor Configuration File. Only the parameters defined in the file will be changed in the corresponding sensor. The rest of the sensor's configuration remains unchanged.

NOTE: Only Specialists can apply Sensor Configuration Files to sensors.

Example for a Sensor Configuration File

The three lines in the header define that this configuration is uniquely compatible with a VISIFERM DO 120 sensor (PN 242450-01) with firmware version ODOUM038 and the sensor ID DO1. The following lines set up the unit and 4-20 mA configuration of the primary measurement parameter.

```
PART;242450-01
FIRMWARE;ODOUM038
SENSOR;DO1
REGISTER;2090;2;H;0x10;Measurement unit is %-vol
REGISTER;4364;2;H;0x1;readout of the primary measurement parameter via
the 4-20mA interface
```

```
REGISTER;4360;2;H;0x2;linear configuration 4-20mA linear
REGISTER;4378;6;F F F;0 62.85 0;Konfiguration 4-20mA (min,max,mid
value)
```

Sub-Task 6.3 Loading a Sensor Configuration File onto a sensor

Loading the Sensor Configuration File from a USB memory stick to ARC View Handheld:

1. Place ARC View Handheld in the Dock, and connect a memory stick containing the Sensor Configuration File.
2. Go to ARC View Handheld → Tools → Data management → Data transfer (USB device to ARC View).
3. Select the Sensor Configuration File and click Ok.
4. You will be informed about the data transfer status.

Loading the Sensor Configuration File from the Handheld to the sensor:

1. Go to [Sensor] → Tools → Data management → Data transfer (ARC View to sensor) → Configuration Profile, and click OK.
2. Select your file, and click OK.
3. The parameters defined in the Sensor Configuration File will be applied to the sensor.

Section 3 Handheld screen reference

This section offers full details of all screens on the HAMILTON ARC View Handheld.

Section 3.1 ARC View Handheld screens: full listing

Table 3.1 Reference list of ARC View Handheld screens

Scrn	Path	Page
19	[Sensor] → View → Graph	79
20	[Sensor] → View → Sensor status	80
21	[Sensor] → View → Sensor status → Total operating hours	83
22	[Sensor] → View → Sensor info	84
23	[Sensor] → View → Interface configuration	85
24	[Sensor] → View → Interface configuration → Digital RS485	86
25	[Sensor] → View → Interface configuration → mA interface #1 [or #2]	87
26	[Sensor] → View → Interface configuration → mA/ECS-Interface	88
27	[Sensor] → View → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration	90
28	[Sensor] → View → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface]→ Error/warning configuration	92
29	[Sensor] → Tools	93
30	[Sensor] → Tools → Measurement	95
31	[Sensor] → Tools → Measurement → Measurement data	98
32	[Sensor] → Tools → Measurement → CIP/SIP definition	98
33	[Sensor] → Tools → Measurement → Graph/data log	99
34	[Sensor] → Tools → Calibration	100
35	[Sensor] → Tools → Calibration → Calibration data	101
36	[Sensor] → Tools → Calibration → Calibration data → Calibration data: point 1 [or point 2]	103
37	[Sensor] → Tools → Calibration → Calibration data → Calibration data: product	105
38	[Sensor] → Tools → Calibration → Calibrate	106
39	[Sensor] → Tools → Calibration → Calibrate → Product calibration	108
40	[Sensor] → Tools → Sensor status	110

Table 3.1 Reference list of ARC View Handheld screens

Scrn	Path	Page
41	[Sensor] → Tools → Interface configuration	110
42	[Sensor] → Tools → Interface configuration → Digital RS485	112
43	[Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface]	113
44	[Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Interface mode	114
45	[Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration	115
46	[Sensor] → Tools → Interface configuration → mA interface #1 [or #2] → Error/warning configuration	118
47	[Sensor] → Tools → Data management	120
48	[Sensor] → Tools → Sensor info	122
49	[Sensor] → Tools → Sensor info → ARC Wi info	123

Table 3.1 Reference list of ARC View Handheld screens

Section 3.2 ARC View Handheld screens: full details

Screen 0: **Highest level of Handheld screen interface**

Screen name: None.

Purpose: Enables selection of the Handheld itself or of a connected sensor, for monitoring or configuration.

Comments: This screen is fully explained in Figure 1.2, *The ARC View Handheld showing top level of interface, pH sensor attached*, on Page 11.

Screen 1: ARC View Handheld → View

Screen name: ARC View / ARC View Handheld

Purpose: Enables access to information about the Handheld, the Dock, and about connected sensors.

Comments: All operators can access this screen.

Device info	Click OK to access a screen showing details of the Handheld and Dock. In some cases, you must access further screens for further details. (The screen you open is Screen 2 on Page 62.)
Connectivity	Click OK to access information about the number of sensors currently connected, and the Baud rate of the wired connection (if there is one) between Handheld and sensor. **NOTE:** From 0 to 30 sensors can be connected wirelessly at any time. (The screen you open is Screen 5 on Page 65.)

Screen 2: ARC View Handheld → View → Device info

Screen name: ARC View / Device info

Purpose: Displays device-specific information about the Handheld and Dock. This information can be useful when troubleshooting with the aid of HAMILTON technical support. (Note that the Handheld must be in the Dock, and the Dock must be connected to the power supply, to obtain information about the Dock.)

Comments:
- All operators can access this screen.
- This screen is identical to Screen 7 on Page 67: ARC View Handheld → Tools → Device info.

Firmware version **V024 30.11.2010**	Displays the firmware version of the Handheld. For information about updating firmware, see Appendix B.2, *Handheld firmware update*, on Page 140.
Serial number **0000298**	Displays the serial number of the Handheld. This is also shown on the identifying label on the back of the Handheld. This value is set in the factory, and cannot be changed.

Workorder number **2091325 / 399**	Displays the workorder number of the Handheld. This is also shown on the identifying label on the back of the Handheld. This number can be useful in tracing faulty units to production runs. The value is set in the factory, and cannot be changed.
Part number **242128**	Displays the part number of the Handheld. This is also shown on the identifying label on the back of the Handheld.
Productname **ARC View Handheld**	Displays the full product name of the Handheld.
Serial number PCB **98273485**	Displays the serial number of the printed circuit board in the Handheld. This number could be useful in troubleshooting with the help of technical support.
RF module info	Click OK to access a a screen showing details of the radio frequency module in the Handheld. (The screen you open is Screen 3 on Page 63.)
ARC View Dock info **This field is available only when the Handheld is in the Dock, and the Dock is connected to the power supply.**	**NOTE:** This field is available only when the Handheld is in the Dock, and the Dock is connected to the power supply. Click OK to access a screen showing details of the Dock. (The screen you open is Screen 4 on Page 64.)

Screen 3: ARC View Handheld → View → Device info → RF module info

Screen name: ARC View / RF modul info

Purpose: Displays device-specific information about the radio frequency module in the Handheld. This information can be useful when troubleshooting with the aid of HAMILTON technical support.

Comments: All operators can access this screen.

RF module firmware version **VRFMS006**	Displays the version of the firmware currently loaded on the printed circuit board of the Handheld. For information about updating firmware, see Appendix B.3, *Handheld RF Module firmware update*, on Page 141.

RF address 59568162	Displays the ARC hardware address of the radio frequency module in the Handheld. This value is set in the factory and cannot be changed.
Serial number PCB 0327562	Displays the serial number of the printed circuit board of the radio frequency module in the Handheld.

Screen 4: `ARC View Handheld` → `View` → `Device info` → `ARC View Dock info`

Screen name: ARC View / Device info

Purpose: Displays device-specific information about the Dock. (Note that the Handheld must be in the Dock, and the Dock must be connected to the power supply, for this screen to be available.)

Comments: All operators can access this screen.

Firmware version DOCKM003	Displays the version of the firmware currently loaded on the printed circuit board of the Dock. For information about updating firmware, see Appendix B.4, *Dock firmware update*, on Page 142.
Serial number 8573	Displays the serial number of the Dock. This is also shown on the identifying label on the back of the Dock.
Workorder number 9374937	Displays the workorder number of the Dock. This is also shown on the identifying label on the back of the Dock. This number can be useful in tracing faulty units to production runs. The value is set in the factory, and cannot be changed.
Part number 242168	Displays the part number of the Dock. This is also shown on the identifying label on the back of the Dock.
Productname ARC Dock	Displays the full product name of the Dock.
Serial number PCB	Displays the serial number of the printed circuit board in the Dock.

Screen 5: ARC View Handheld → View → Connectivity

Screen name: ARC View / Connectivity

Purpose: Displays information about the number of sensors connected to the Handheld and the Baud rate of the connections.

Comments:
- All operators can access this screen.
- The total number of Handheld/sensor connections possible at any time is 30.
- Connections can be wired or wireless, depending on whether the Handheld is in its Dock (wired) or not in its Dock (when connections automatically become radio connections).
- All Handheld/sensor connections take place through the digital interface.

Sensors connected 1	Displays the number of sensors (1 to 30) currently connected to the Handheld.
Baud rate 19200 **This field is shown only when a wired connection is active**	Displays the Baud rate of the wired connection between an ARC sensor's RS485 Modbus digital interface, and the Handheld. (Specialists can change the Baud rate in Screen 16 on Page 76.) **NOTE:** For more information about Baud rates, see Section 1.5.5.3, *Baud rates*.

Screen 6: ARC View Handheld → Tools

Screen name: ARC View / ARC View Handheld

Purpose: Enables access to screens offering information and configuration settings for the Handheld and Dock, and firmware updates for the Handheld, Dock, sensors, and ARC Wi Sensor Adapters.

Comments: The Data management and Settings parts of this screen are password-protected. Only Specialists can see them.

Device info	Click OK to access a screen showing details of the Handheld and Dock. In some cases, you must access further screens for further details. (The screen you open is Screen 7 on Page 67.)

Data management	Click OK to access screens enabling you to: • Copy a sensor STAtus profile (STA) file to a USB memory stick. (See Task 4, *Managing sensor STAtus profiles*, on Page 51.) • Copy trace files to a USB memory stick (See Task 5, *Managing trace files*, on Page 53.) • Copy Configuration profiles to and from a USB memory stick. (See Task 6, *Managing Sensor Configuration Files*, on Page 55.) • Perform firmware upgrades of the Handheld, Dock, and ARC Wi Sensor Adapters. (See Appendix B, *ARC System firmware updates*.) (The first screen you open is Screen 8 on Page 68.)
Settings	Click OK to access screens enabling you to: • Configure the date and time. • Configure automatic switch-off times. • Configure wireless settings. (The first screen you open is Screen 9 on Page 70.)
Connectivity	Click OK to access information about the number of sensors currently connected, and the Baud rate of the wired connection (if there is one) between Handheld and sensor. A further screen enables Specialists to change the Baud rate. **NOTE:** From 0 to 30 sensors can be connected wirelessly at any time. (The screen you open is Screen 18 on Page 78.)

Screen 7: `ARC View Handheld → Tools → Device info`

Screen name: ARC View / Device info

Purpose: Displays device-specific information about the Handheld and Dock. This information can be useful when troubleshooting with the aid of HAMILTON technical support. (Note that the Handheld must be in the Dock, and the Dock must be connected to the power supply, to obtain information about the Dock.)

Comments:
- All operators can access this screen.
- This screen is identical to Screen 2 on Page 62: `ARC View Handheld → View → Device info`.

Screen 8: ARC View Handheld → Tools → Data management

Screen name: ARC View / Data management

Purpose: Enables Specialists to copy data to and from the ARC View Handheld. Data to the Handheld comprise firmware updates for Handheld, Dock, ARC Wi Sensor Adapter as well as Sensor Configuration Files.
Data from the Handheld comprise: Previously-recorded sensor STAtus profile (STA) files, each containing details of permanent data (serial number, and so on), temporary data (settings), and 'snapshot' data (readings) for a sensor, Sensor Configuration Files, used for programming sensor settings, and trace files (measurement data).

Comments:
- This screen is password protected. Only Specialists can access it.
- To access this screen, the Handheld must be in the Dock and the Dock must be connected to a power supply. In addition, a suitable USB memory stick must be inserted into the Dock to use the data functions.

Data transfer (ARC View to USB device)

Enables Specialists to copy a sensor STAtus profile (STA) file, a Sensor Configuration File or a trace file from the Handheld to a USB memory stick inserted in the Dock.

NOTE: Before you can copy an STA file or Sensor Configuration File to a memory stick, you must first create an appropriate file:

- For general information about creating and reading an STA file, See Task 4, *Managing sensor STAtus profiles*, on Page 51.
- For details of the STA file's contents, see Appendix C, *Sensor STAtus profile*.
- For information about creating a Sensor Configuration File, see Task 6, *Managing Sensor Configuration Files*, on Page 55.
- For documents with information about the programming syntax of the Sensor Configuration Files, see Appendix A.5, *HAMILTON ARC System documents*, on Page 137.
- For information about trace files, seeTask 5, *Managing trace files*, on Page 53.

Click OK to access the screens that enable you to copy the file.

(The first screen you open is Screen 9 on Page 70.)

Data transfer (USB device to ARC View)	Enables Specialists to copy language files and Sensor Configuration Files from a USB memory stick to the Handheld. For information about Sensor Configuration Files, see Task 6, *Managing Sensor Configuration Files*, on Page 55.
Firmware update ARC View	Enables Specialists to update the firmware in the Handheld. (This firmware contains the screens that you see on the Handheld.) **NOTE:** Before updating the Handheld, read Appendix B.2, *Handheld firmware update*, on Page 140. Click OK to access the screens that enable you to perform this update. (The first screen you open is Screen 11 on Page 72.)
Firmware update RF module	Enables Specialists to update the firmware in the Handheld's radio frequency module. **NOTE:** Before updating the Handheld's RF module, read Appendix B.3, *Handheld RF Module firmware update*, on Page 141. Click OK to access the screens that enable you to perform this update. (The first screen you open is Screen 12 on Page 73.)
Firmware update ARC Dock	Enables Specialists to update the Dock firmware. **NOTE:** Before updating the Handheld's Dock, read Appendix B.4, *Dock firmware update*, on Page 142. Click OK to access the screens that enable you to perform this update. (The first screen you open is Screen 13 on Page 73.)

Firmware update ARC Wi	Enables Specialists to update the ARC Wi Sensor Adapter firmware. **NOTE:** Before updating the ARC Wi Sensor adapters, read Appendix B.6, *Wi Sensor Adapter firmware update*, on Page 144. Click OK to access the screens that enable you to perform this update. (The first screen you open is Screen 14 on Page 74.)

Screen 9: ARC View Handheld → Tools → Data management → Data transfer (ARC View to USB device)

Screen name: ARC View / Data transfer

Purpose: An intermediary screen helping to enable a Specialist to copy a sensor STAtus profile (STA) file, Sensor Configuration Files and trace files to a USB memory stick.

Sensor status profile	Enables you to copy a previously-recorded sensor STAtus profile (STA) file from the Handheld in the Dock to a memory stick inserted in the USB socket in the Dock. Click OK. An intermediary screen opens displaying one or more STA files that you can copy to the memory stick inserted in the Dock. Select one of the files you wish to download to the memory stick and click OK. A final intermediary screen opens, giving a brief overview of the file you have selected. If the details confirm that the file is correct, click OK to download the file to the memory stick. If you have selected the wrong file, click the Left Key to return to the list, and reselect. **NOTE:** You can download as many files as you like to the memory stick, within the constraints of the stick's memory. **NOTE:** For more information, see: • Task 4, *Managing sensor STAtus profiles*, on Page 51. • Appendix C, *Sensor STAtus profile*.

Configuration profile	Enables you to copy a Sensor Configuration File from the Handheld to a memory stick inserted in the USB socket of the Dock. For the further proceeding, please see the description for sensor STAtus profiles above. **NOTE:** For information about Sensor Configuration Files, see Task 6, *Managing Sensor Configuration Files*, on Page 55.
Graph/data log	Enables you to copy a trace file from the Handheld to a memory stick inserted in the USB socket of the Dock. For the further proceeding, please see the description for sensor STAtus profiles above. **NOTE:** For information about trace files, see Task 5, *Managing trace files*, on Page 53.

Screen 10: ARC View Handheld → Tools → Data management → Data transfer (USB device to ARC View)

Screen name: ARC View / Data transfer

Purpose: An intermediary screen enabling a Specialist to copy additional language files and Sensor Configuration Files to the Handheld.

Optional languages	Enables you to copy a language file from a memory stick inserted in the USB socket in the Dock to a Handheld. Click OK. An intermediary screen opens displaying one or more language files on the memory stick. Select the file you wish to copy to the Handheld and click OK.

Configuration profile	Enables you to copy a Sensor Configuration File from a memory stick inserted in the USB socket of the Dock to a Handheld. Click OK. An intermediary screen opens displaying one or more Sensor Configuration Files available on the memory stick. Select one of the files you wish to copy to the Handheld and click OK. **NOTE:** ARC View Handheld can store at most 16 files per file type. Maximum size for a single file is 256 kb. **NOTE:** For information about Sensor Configuration Files, see Task 6, *Managing Sensor Configuration Files*, on Page 55.

Screen 11: ARC View Handheld → Tools → Data management → Firmware update ARC View

Screen name: ARC View / Firmware update ARC View

Purpose: An intermediary screen enabling a Specialist to update the firmware on the Handheld.

VHMS024	Select the Handheld firmware update file you require (typically, there is only one) and click OK. **NOTE:** Handheld firmware files have the suffix .mot, but suffixes are not shown on the Handheld screen.

Screen 12: ARC View Handheld → Tools → Data management → Firmware update RF module

Screen name: ARC View / Firmware update RF module

Purpose: An intermediary screen helping to enable a Specialist to update the firmware on the Handheld's RF module.

VRFMS006

Select the Handheld RF module firmware update file you require (typically, there is only one) and click OK.

NOTE: Handheld RF module firmware files have the suffix .bin, but suffixes are not shown on the Handheld screen.

Screen 13: ARC View Handheld → Tools → Data management → Firmware update ARC Dock

Screen name: ARC View / Firmware update ARC Dock

Purpose: An intermediary screen helping to enable a Specialist to update the firmware in the Dock.

DOCKM004

Select the Dock firmware update file you require (typically, there is only one) and click OK.

NOTE: Dock firmware files have the suffix .hex, but suffixes are not shown on the Handheld screen.

Screen 14: ARC View Handheld → Tools → Data management → Firmware update ARC Wi

Screen name: ARC View / Firmware update ARC Wi

Purpose: An intermediary screen helping to enable a Specialist to update the ARC Wi Sensor Adapter firmware.

WI0MS006	Select the ARC Wi Sensor Adapter firmware update file you require (typically, there is only one) and click OK. **NOTE:** ARC Wi Sensor Adapter firmware files have the suffix .bin, but suffixes are not shown on the Handheld screen.

Screen 15: ARC View Handheld → Tools → Settings

Screen name: ARC View / Settings

Purpose: Enables a Specialist to set the current time on the real-time clock shown on the front screen of the Handheld. In addition, the current date can be set. (Both date and time are used to stamp files created by the ARC System.) Also, settings for display-on time, power-on time, and wireless connection can be made. Furthermore, passwords for operator level Administrator (A) and Specialist (S) can be changed. Finally, factory settings can be reset.

Comments: This screen is password protected. Only Specialists can access it.

Set time	Click OK to access a screen on which you can set the time for the real-time clock shown on the front screen of the Handheld (Figure 1.2, on Page 11). (This screen is very simple and intuitive, and is not documented separately below.) Note that the time is in 24-hour format.
Set date	Click OK to access a screen on which you can set the date. (This screen is very simple and intuitive, and is not documented separately below.) The date is not displayed on the front screen of the Handheld, but is important for marking generated files, such as the sensor STAtus profile (STA) file.

Display settings	Click OK to access a screen on which you can set the length of time in minutes that the Handheld display stays illuminated between key presses. (This screen is very simple and intuitive, and is not documented separately below.) If you enter a value of 000, the screen never switches off. If you enter a value of 999, the screen switches off after a default time of 5 minutes. **NOTE:** This setting does not switch off the Handheld or cause monitoring of sensors to stop. It only switches off the display.
Power settings	Click OK to access a screen on which you can set the length of time in minutes that the Handheld remains switched on between key presses. (This screen is very simple and intuitive, and is not documented separately below.) If you enter a value of 000, the Handheld never switches off. If you enter a value of 999, the Handheld switches off after a default time of 20 minutes.
Wireless settings	Click OK to access a screen on which you can select one of the following: • Auto Default mode. The ARC wireless system between the ARC Wi Sensor Adapters on the sensors, and the radio frequency module in the Handheld switches on automatically when the Handheld is removed from the Dock. • Always ON: The ARC wireless system is always switched on, even when the Handheld is in its Dock. Operators can work in wireless mode with the Handheld in the Dock, and can see all sensors that are wirelessly connected to the Handheld.

Change password	Enables you to change the password for operator level Administrator (A) or Specialist (S). Click OK to access a screen on which you can select one of the following: • `Change password for A:` Click OK for a screen for entering the new password. You will be asked to enter the password a second time for confirmation. • `Change password for S:` Click OK for a screen for entering the new password. You will be asked to enter the password a second time for confirmation.
Restore factory settings	Enables you to set the ARC View Handheld back to factory settings. Click OK to access a screen on which you confirm that the configuration should be reset to factory settings. **NOTE:** If you restore the factory default settings, all settings you you customized on your device will be lost. For more information about restoring the factory settings, see Section 4.6, *Restore Factory Settings*, on Page 132.

Screen 16: `ARC View Handheld` → `Tools` → `Connectivity`

Screen name: ARV View / Connectivity

Purpose: Enables all operators to see the number of sensors connected, and the Baud rate of the connections. Specialists can also change the Baud rate.

Comments: This screen is the same as Screen 3 on Page 63: `ARC View Handheld` → `View` → `Device info` → `RF module info`, except that it enables Specialists to change the Baud rate of Handheld.

Sensors connected 1	Displays the number of sensors (1 to 30) currently connected to the Handheld. Click OK to access a screen which enables you to manage a list of sensor favorites. (The screen you open is Screen 17 on Page 77.)

Baud rate	19200

This field is shown only when a wired connection is active

Displays the Baud rate of the wired connection between an ARC sensor's RS485 Modbus digital interface, and the Handheld.

Click OK to access a screen enabling you to change the Baud rate. (This screen is very simple and intuitive, and is not documented separately below.)

NOTE: For more information about Baud rates and their effect on the ARC View System, see Section 1.5.5.3, *Baud rates*.

Screen 17: `ARC View Handheld` → `Tools` → `Connectivity` → `Sensors connected`

Screen name: ARC View / Connected sensors

Purpose: Enables all operators to see the number of monitored sensors, and the Baud rate of the ARC View Handheld wired connection. Specialists can also change the Baud rate.

Comments: If you select this path: `ARC View Handheld` → `View` → `Connectivity` → `Sensors connected`, you will receive the message `operator level not valid`.

Select favorites

Click OK to access a screen on which you can select favorites from a list of sensors monitored by the Handheld. The favorites will be permanently stored in the memory of the Handheld. The corresponding sensors will be presented at the top level of the Handeheld's interface.

Arrange favorites

Click OK to access a screen where you can sort the favorites list. To do this, select the sensor of interest and click OK. Move the cursor to a new position and click OK. The two positions will be exchanged.

Delete sensor list

Click OK to access a screen that allows you to delete the sensor favorites.

Click OK on this screen to delete the sensor list, or the left button to return to the previous screen.

NOTE: The connection between sensors and handheld is lost after deleting the favorites. Return to the top level of the interface to reestablish the connections to sensors available in your network.

Screen 18: [*Sensor*] → View

Screen name: [Sensor type] / [*Sensor ID*] / View

Purpose: Enables all operators to access many kinds of information about a sensor with the aid of further screens.

Comments: All operators can access this screen.

Graph	Click OK to access a real-time graph tracing readings of the sensor now selected on the Handheld. (The screen you open is Screen 19 on Page 79.)
Sensor status	Click OK to access full details of the current operating status of the sensor now selected on the Handheld. (The screen you open is Screen 20 on Page 80.)
Sensor info	Click OK to access full factory identification details of the sensor now selected on the Handheld. (The screen you open is Screen 22 on Page 84.)
Interface configuration	Click OK to access further screens offering full details of: • The digital RS485 configuration • The analog 4–20 mA configuration(s) of the sensor now selected on the Handheld. (The first screen you open is Screen 23 on Page 85.)

Screen 19: [*Sensor*] → View → Graph

Screen name: [*Sensor type*] / [*Sensor ID*] / Graph

Purpose: Enables all operators to view real-time and recent data from a sensor, in a graphical form.

Comments: All operators can access this screen.

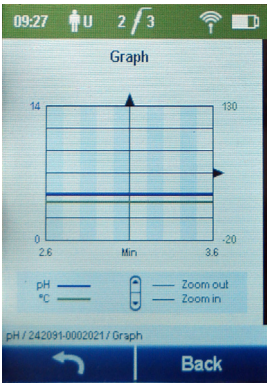


Figure 3.1 Graph for pH sensor before 3.6 minutes

The graph begins to form as soon as the operator clicks OK.

The details of the graph depend on the sensor type for which it is displaying data.

Use the up and down arrow buttons to change the scale of the X-axis (zoom in and zoom out). Three scales are possible: 1 minute, 10 minutes and 100 minutes.

Screen 20: [*Sensor*] → View → Sensor status

Screen name: [*Sensor type*] / [*Sensor ID*] / Sensor status

Purpose: Enables access, both directly and through further screens, to information about the current operating status of the sensor. For instance, operating hours, sensor condition, and warning and error messages can be viewed.

Comments:
- All operators can access this screen.
- Warning messages indicate that an area of sensor functionality is compromised, although the sensor can still give a reading. For more information, see Section 4.4, *Troubleshooting warning and status messages*, on Page 127.
- Error messages indicate that an area of sensor functionality has failed, and that the sensor cannot give a reading. For more information, see Section 4.5, *Troubleshooting error messages*, on Page 130.

Total operating hours **875.53h**	Displays the total number of operating hours for the sensor now selected on the Handheld. Click OK to access a screen giving a detailed breakdown of: • Operating hours at various temperatures. • Counters for the number of Sterilizations In Place and Cleanings In Place. (The screen you open is Screen 21 on Page 83.)
Quality indicator **excellent**	Displays a HAMILTON-specific qualitative expressing the current reliability of the sensor now selected on the Handheld. (Accuracy and reliability of all sensors can decline with use.) Possible values are: • excellent • good • acceptable • poor • very poor • defective **NOTE:** For information about the quality indicator, see Section 1.5.11, *ARC sensor measurements: quality indicator*, on Page 34.

Warnings: measurement 0	Displays the number of warning messages currently in force with respect to measurements. Click OK to access the `Warnings: measurement` screen for the text of each message. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For information about the messages that can be displayed, see Section 4.4.1, *Measurement warnings*, on Page 127.
Warnings: calibration 1	Displays the number of warning messages currently in force with respect to calibration. Click OK to access the `Warnings: calibration` screen for the text of each message. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For information about the messages that can be displayed, see Section 4.4.2, *Calibration warnings*, on Page 128.
Warnings: interface 0	Displays the number of warning messages currently in force with respect to the interface. Click OK to access the `Warnings: interface` screen for the text of each message. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For information about the messages that can be displayed, see Section 4.4.4, *Interface warnings*, on Page 129.
Warnings: hardware 0	Displays the number of warning messages currently in force with respect to hardware. Click OK to access the `Warnings: hardware` screen for the text of each message. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For information about the messages that can be displayed, see Section 4.4.5, *Hardware warnings*, on Page 130.

Errors: measurement 0	Displays the number of error messages currently in force with respect to measurement. Click OK to access the `Errors: measurement` screen for the text of each message. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For information about the messages that can be displayed, see Section 4.5.1, *Measurement errors*, on Page 130.
Errors: calibration 0	Displays the number of error messages currently in force with respect to calibration. Click OK to access the `Errors: calibration` screen for the text of each message. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For information about the messages that can be displayed, see Section 4.5.2, *Calibration errors*, on Page 131.
Errors: interface 0	This option reserved for possible future use.
Errors: hardware 0	Displays the number of error messages currently in force with respect to hardware. Click OK to access the `Errors: hardware` screen for the text of each message. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For information about the messages that can be displayed, see Section 4.5.3, *Hardware errors*, on Page 132.

Screen 21: [*Sensor*] → View → Sensor status → Total operating hours

Screen name: [Sensor type] / [*Sensor ID*] / Operating hours/counters

Purpose: Enables access to information about the operational history of the sensor.

Comments:
- All operators can access this screen.
- Operation, sterilization, and cleaning at high temperatures can all reduce the life, accuracy, and reliability of any sensor. This screen offers data about these wear factors. For more information, see Section 1.5.7, *ARC sensors: Cleanings and Sterilizations In Place*, on Page 31.
- All values on this screen are held in memory, in the sensor.

Total operating hours **177.67 h**	Displays the total number of hours the sensor now selected on the Handheld has operated during its entire life.
Operating hours > 85°C **936 h**	Displays the total number of hours the sensor now selected on the Handheld has operated above 85°C maximum measurement temperature during its entire life.
Operating hours > 135°C **0 h**	Displays the total number of hours that the sensor now selected on the Handheld has operated above 135°C maximum operating temperature during its entire life.
Number of SIP **0**	Displays the total number of Sterilizations In Place that the sensor now selected on the Handheld has undergone during its entire life. **NOTE:** For more information about SIPs, see Section 1.5.7, *ARC sensors: Cleanings and Sterilizations In Place*, on Page 31.
Number of CIP **0**	Displays the total number of Cleanings In Place that the sensor now selected on the Handheld has undergone during its entire life. **NOTE:** For more information about CIPs, see Section 1.5.7, *ARC sensors: Cleanings and Sterilizations In Place*, on Page 31.
Total power-ups **60**	Displays the total number of times that the sensor now selected on the Handheld was switched on during its entire life.

Screen 22: [*Sensor*] → View → Sensor info

Screen name: [*Sensor type*] / [*Sensor ID*] / Sensor info

Purpose: Enables access to manufacturing information uniquely identifying a sensor.

Comments:
- All operators can access this screen.
- See Task 4, *Managing sensor STAtus profiles*, on Page 51 for information about creating a file of extremely detailed sensor information.

Sensor ID **242450-3001**	Displays a string identifying the sensor now selected on the Handheld. By default, the string is the sensor's part number followed by its serial number. (Specialists can change the Sensor ID. See Screen 48 on Page 122.)
Firmware version **ODOUM039**	Displays the version of the firmware currently loaded on a memory chip in the sensor, for the sensor now selected on the Handheld. For information about updating firmware, see Appendix B.5, *ARC sensor firmware update*, on Page 143.
Serial number **3001**	Displays the serial number of the sensor now selected on the Handheld. (By default, the serial number is also part of the Sensor ID.) This value is set in the factory and cannot be changed.
Workorder number **296588/399**	Displays the workorder number of the sensor now selected on the Handheld. This number can be useful in tracing faulty sensors to production runs. This value is set in the factory and cannot be changed.
Part number **242450**	Displays the part number of the sensor now selected on the Handheld. This value is set in the factory and cannot be changed.
Productname **VISIFERM DO 120**	Displays the product name of the sensor now selected on the Handheld. This string is set in the factory and cannot be changed.

Serial number user end **non-applicable**	Displays the serial number of the electronics in the user end. ("User end" refers to the communication electronics in the sensor.) **NOTE:** VISIFERM DO sensors do not have a separate user end and front end. Instead, they have a single integrated unit. For this reason, "Not applicable" is shown in this example.
Serial number front end **non-applicable**	Serial number of the electronics in the front end. ("Front end" refers to the measurement electronics in the sensor.) **NOTE:** VISIFERM DO sensors do not have a separate user end and front end. Instead, they have a single integrated unit. For this reason, "Not applicable" is shown in this example.
ARC Wi Info	Click OK to access a screen of information about the ARC Wi Sensor Adapter fitted to the sensor now selected on the Handheld. (The screen you open is Screen 46 on Page 118.)

Screen 23: [*Sensor*] → View → Interface configuration

Screen name: [*Sensor type*] / [*Sensor ID*] / Interface configuration

Purpose: To enable access to further screens showing detailed information about the configuration of the digital and analog interface(s) of a sensor.

Comments:
- All operators can access this screen.
- A sensor's analog interfaces are for communication between the sensor and the process control system, not for sensor/Handheld communication.
- By default, mA interface #1 is for the primary measurement parameter (dissolved oxygen, conductivity, or pH), and mA interface #2 is for the secondary parameter (always temperature). However, Specialists can change this default by mapping measurement parameters to either interface. (See Screen 45 on Page 115: [Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration.)
- A sensor's digital interface is for communication between the sensor and Handheld, personal computer (PC), or digital PLC.

Digital RS485	**NOTE:** This field is shown for all sensors. Click OK to access further screens giving information about the digital RS485 interface. (The screen you open is Screen 24 on Page 86.)

mA interface #1	4–20 mA linear

This field not shown for DO (non-ARC) sensors.

NOTE: This field is shown for all ARC sensors. These are currently all the pH, dissolved oxygen, and conductivity ARC sensors.

Click OK to access further screens giving information about mA interface #1.

(The screen you open is Screen 25 on Page 87.)

mA interface #2	4–20 mA linear

This field not shown for DO sensors.

NOTE: This field is shown only for sensors with two analog interfaces. These are currently all the pH and conductivity ARC sensors.

Click OK to access further screens giving information about mA interface #2.

(The screen you open is Screen 26 on Page 88.)

mA/ECS-Interface	4–20 mA linear

This field only shown for DO (non-ARC) sensors.

NOTE: This field is shown only for the VISIFERM DO (non-ARC) sensor, which has one analog interface.

Click OK to access further screens giving information about the mA/ECS-Interface.

(The screen you open is Screen 26 on Page 88.)

Screen 24: [*Sensor*] → View → Interface configuration → Digital RS485

Screen name: [*Sensor type*] / [*Sensor ID*] / Digital RS485

Purpose: Enables access to information about the configuration of the digital interface.

Comments:
- All operators can access this screen.
- A sensor's digital interface is for communication between the sensor and Handheld, personal computer (PC), or digital PLC.

Baud rate	19200

Displays the Baud rate of the digital interface of the sensor that is selected on the top level of the Handheld's user interface.

(Specialists can change the Baud rate on Screen 42 on Page 112.)

NOTE: For more information about Baud rates, see Section 1.5.5.3, *Baud rates*.

Modbus device address 1	Displays the Modbus device address of the sensor now selected on the Handheld. (Specialists can change the Modbus device address on Screen 42 on Page 112.) **NOTE:** For more information about Modbus device addresses, see Section 1.5.5.2, *Modbus device addresses*.
Parity none	Displays the parity status of the RS485 interface. (This value is required for programming the PLC.) Operators cannot change this status.
Stop bits 2	Displays the number of stop bits set for the RS485 interface. (This value is required for programming the PLC.) Operators cannot change this status.

Screen 25: [*Sensor*] → View → Interface configuration → mA interface #1 [or #2]

Screen name: [*Sensor type*] / [*Sensor ID*] / Analog 1

Purpose: Enables access to information about the configuration of mA interface #1.

Comments:
- All operators can access this screen.
- A sensor's analog interfaces are for communication between the sensor and the process control system, not for sensor/Handheld communication.
- By default, mA interface #1 is for the primary measurement parameter (dissolved oxygen, conductivity, or pH), and mA interface #2 is for the secondary parameter (always temperature). However, Specialists can change this default by mapping measurement parameters to either interface. (See Screen 45 on Page 115: [Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration.)

Interface mode 4–20 mA linear	Displays, for the sensor now selected on the Handheld, the interface mode currently set for mA interface #1. For more information about interface modes, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.

Output current configuration	Click OK to access a screen showing the mapping of: • Analog interface output values to • Measurement parameter values for mA interface #1 of the sensor now selected on the Handheld. (The screen you open is Screen 27 on Page 90).
Error/warning configuration	Click OK to access a screen showing the mapping of: • Analog interface output values to • Errors and warnings for mA interface #1 of the sensor now selected on the Handheld. (The screen you open is Screen 28 on Page 92.)

Screen 26: [*Sensor*] → View → Interface configuration → mA/ECS-Interface

Screen name: [*Sensor type*] / [*Sensor ID*] / Analog 1

Purpose: Enables access to information about the configuration of the mA/ECS interface found only on the VISIFERM DO (non-ARC) sensor. (The ECS interface is designed to emulate an electro-chemical sensor's output.)

Comments:
- All operators can access this screen.
- The VISIFERM DO ARC sensor's analog interface is for communication between the sensor and the process control system, not for sensor/Handheld communication.

Interface mode **4–20 mA linear**	Displays, for the VISIFERM DO (non-ARC) sensor now selected on the Handheld, the interface mode currently set. **NOTE:** For more information about interface modes, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.

Output current configuration	Click OK to access a screen showing the mapping of: • Analog interface output values to • Measurement parameter values for the analog interface of the VISIFERM DO (non-ARC) sensor now selected on the Handheld. (The screen you open is Screen 27 on Page 90).
Error/warning configuration	Click OK to access a screen showing the mapping of: • Analog interface output values to • Errors and warnings for the analog interface of the VISIFERM DO (non-ARC) sensor now selected on the Handheld. (The screen you open is Screen 28 on Page 92.)

Screen 27: [*Sensor*] → View → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration

Screen name: [*Sensor type*] / [*Sensor ID*] / Configuration output current

Purpose: Enables access to information about the configuration of mA interface #1 or #2, for pH and conductivity ARC sensors, and the single analog ECS interface of VISIFERM DO (non-ARC) sensors, depending on selections made in previous screens.

Comments:
- All operators can access this screen.
- A sensor's analog interfaces are for communication between the sensor and the process control system, not for sensor/Handheld communication.
- By default, mA interface #1 is for the primary measurement parameter (dissolved oxygen, conductivity, or pH), and mA interface #2 is for the secondary parameter (always temperature). However, Specialists can change this default by mapping measurement parameters to either interface. (See Screen 45 on Page 115: [Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration.)

Interface mode **4–20 mA linear**	Displays the mode currently set for the selected analog interface of the sensor selected on the Handheld. This analog interface can be: • mA interface #1 • mA interface #2 • mA ECS-Interface (the single ECS analog interface of a VISIFERM DO (non-ARC) sensor) **NOTE:** For more information about interface modes, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.
Measurement variable **T**	Displays the measurement variable currently assigned to the selected analog interface of the sensor selected on the Handheld. **NOTE:** By default, the primary measurement variable of the sensor, DO (dissolved oxygen), pH, or Cond (conductivity) is assigned to mA interface #1. However, Specialists can change this to the secondary measurement parameter, T (temperature) on Screen 45 on Page 115.

Value at 4 mA **0°C**	Displays, for the selected analog interface of the sensor now selected on the Handheld, the mapping between: • The lowest output current (4 mA) of the analog interface. • A measurement parameter value of the sensor. As an example shown, a temperature of 0°C causes the sensor to output a current of 4 mA. (Specialists can set this mapping on Screen 45 on Page 115.) **NOTE:** For more information, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.
Value at 20 mA **35.00°C**	Displays, for the selected analog interface of the sensor now selected on the Handheld, the mapping between: • The highest output current (20 mA) of the analog interface. • A measurement parameter value of the sensor. In the example shown here, a temperature of 35.00°C causes the sensor to output a current of 20 mA. (Specialists can set this mapping on Screen 45 on Page 115.) **NOTE:** For more information, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.
Active output signal **14.1 mA**	Displays, for the selected analog interface of the sensor now selected on the Handheld, the current that is being output at this time. This current is for the measurement parameter set in the `Measurement variable` field shown above. **NOTE:** The value shown is valid and accurate only when the output is correctly connected to an analog PLC.

Screen 28: [*Sensor*] → View → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Error/warning configuration

Screen name: [*Sensor type*] / [*Sensor ID*] / Configuration error / warning

Purpose: Enables the viewing of the analog interface's defined responses to errors and warnings.

Comments:
- All operators can access this screen.
- A sensor's analog interface or interfaces are for communication between the sensor and the process control system, not for sensor/Handheld communication.

Interface mode **4–20 mA linear**	Displays, for the sensor now selected on the Handheld, the interface mode of the selected analog interface. (Specialists can set the interface mode on Screen 43 on Page 113.) **NOTE:** For more information about interface modes, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.
Mode in event of warning **No output**	Displays, for the sensor now selected on the Handheld, the response of the selected analog interface when a warning is active. The analog interface can be configured to respond in one of three ways in event of a warning: • Continuous: The analog interface sends a continuous signal to the process control system. • Alternating: The analog interface sends a square wave signal to the process control system. • No output: The analog interface sends no signal to the process control system. **NOTE:** For more information, see Output in event of warning below.
Mode in event of error **Continuous**	Displays, for the sensor now selected on the Handheld, the response of the selected analog interface when an error status is triggered by the sensor. **NOTE:** For more information, see Output in event of warning below.

Output in event of warning **3.5 mA**	Displays, for the sensor now selected on the Handheld, the output current from the selected analog interface when a warning is active. An appropriate warning message is generated. For more information, see Section 4.4, *Troubleshooting warning and status messages*, on Page 127.
Output in event of error **3.5 mA**	Displays, for the sensor now selected on the Handheld, the output current from the selected analog interface when an error is active. An appropriate error message is generated. For more information, see Section 4.4, *Troubleshooting warning and status messages*, on Page 127.
Output for T out of limit **3.5 mA**	Displays, for the sensor now selected on the Handheld, the output current configured for the selected analog interface to indicate that temperature is above its accepted range. In this way, you can use the temperature measurement as an alarm device. **NOTE:** All ARC sensors have a temperature measurement function.

Screen 29: [*Sensor*] → Tools

Screen name: [*Sensor type*] / [*Sensor ID*] / Tools

Purpose: Enables Administrators and specialists to access a range of screens showing very detailed information concerning the identity and current status of the selected sensor. Administrators and Specialists can calibrate sensors. Specialists can configure sensors.

Measurement	Click OK to access a range of screens giving very detailed information about the sensor now selected on the Handheld. (The first screen you open is Screen 30 on Page 95.)

Calibration	Click OK to access screens giving full details of the last calibration of the sensor now selected on the Handheld. These screens also enable Specialists to perform calibrations on the sensor. (The first screen you open is Screen 34 on Page 100.)
Sensor status	Click OK to access details of the operating status of the sensor now selected on the Handheld, with respect to: • Total operating hours of the sensor. • Quality indicator of the reading. • Active warning or error messages. (The screen you open is Screen 40 on Page 110.)
Interface configuration	Click OK to access further screens offering full details of the following, for the sensor now selected on the Handheld: • The digital RS485 configuration • The analog 4–20 mA configuration(s) These screens also enable Specialists to make changes to the configuration of these interfaces. (The first screen you open is Screen 41 on Page 110.)
Data management	Click OK to access further screens enabling Specialists to do the following for the sensor now selected on the Handheld: • Copy a sensor STAtus profile (STA) from the sensor to the Handheld. (See Task 4, *Managing sensor STAtus profiles*, on Page 51.) • Update the firmware in the sensor. (See Appendix B.5, *ARC sensor firmware update*.) (The first screen you open is Screen 47 on Page 120.)
Sensor info	Click OK to access a screen showing identification details of the sensor now selected on the Handheld, and enabling Specialists to change the `Sensor ID`. (The screen you open is Screen 42 on Page 112.)

Screen 30: [*Sensor*] → Tools → Measurement

Screen name: [Sensor type] / [Sensor ID] / Measurement

Purpose: Displays current measurements, units for measurements, parameters for measurements, and definitions of CIPs and SIPs valid within the ARC system. Specialists can set the units used in some fields.

Comments: This screen is password protected. Only specialists can make changes.

Measurement data	Click OK to access the real-time values of the measurements being made now, by the sensor selected on the Handheld. (Accessing this information is a two-step process, starting at Screen 31 on Page 98.)
Graph/data log	Click OK to access a real-time graph of measurements being made by the sensor selected on the Handheld. While this screen is opened, data will be logged in a trace file. (Accessing this information is a two-step process, starting at Screen 19 on Page 79.)
Unit for DO **%-vol**	Displays the measurement unit currently set for the measurement parameter indicated, for the sensor now selected on the Handheld. In the example shown here, the parameter dissolved oxygen is measured in the unit percentage by volume. Click OK to access a screen enabling you to set different measurement units for this parameter. The units available depend on the parameter.
Unit for T **°C**	Displays the measurement unit currently set for the measurement parameter indicated, for the sensor now selected on the Handheld. In the example shown on the left, the parameter temperature is measured in the unit degrees Centigrade. Click OK to access a screen enabling you to set different measurement units for this parameter.

Salinity **1mS/cm** **This field applies to the dissolved oxygen sensor only**	Displays the salinity level currently set for the sensor now selected on the Handheld. This parameter enables you to calculate the correct oxygen concentrations in different aqueous solutions. Click OK to access a screen enabling you to set a different value for solution salinity. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** The unit delivered by the sensor is always the conductivity unit, micro Siemens per centimeter, and cannot be changed.
Air pressure **913mbar** **This field applies to the dissolved oxygen sensor only**	Displays the air pressure currently set for the environment of the sensor now selected on the Handheld. Click OK to access a screen enabling you to set a different value for this pressure. This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** The unit delivered by the sensor is always the millibar, and cannot be changed.
Temp. comp. factor **0%/K** **This field applies to the conductivity sensor only**	Displays the compensation factor currently set for the reading made by the conductivity sensor now selected on the Handheld. Click OK to access a screen enabling you to set a different value for this compensation factor. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For more information, see Section 1.5.10, *ARC sensor measurements: temperature compensation factor*, on Page 34.

Moving average 16	Displays the moving average currently set for measurements made by the sensor selected on the Handheld. **NOTE:** With pH sensors, the figure is an average over the measurement of a resistance, and the label `Moving average R` is used. • The DO sensor accepts a value from 1 to 30. Alternatively, a value of 0 initiates automatic setting of the value by the sensor. • The pH sensor accepts a value of 1 to 16. • The conductivity sensor accepts a value of 1 to 16. Click OK to access a screen enabling you to set a different value for moving average. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For more information, see Section 1.5.8, *ARC sensor measurements: moving average*, on Page 32.
Resolution 3 **This field applies to the dissolved oxygen sensor only**	Displays the resolution currently set for measurements made by the sensor selected on the Handheld. In the example shown on the left, the value of 3 has been set. Click OK to access a screen enabling you to set a different value for resolution. The DO sensor uses this parameter, and accepts a value of 1 to 16. Alternatively, you can enter a value of 0 to initiate automatic setting of the value by the DO sensor. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For more information, see Section 1.5.9, *ARC sensor measurements: resolution*, on Page 32.
CIP/SIP definition	Click OK to access a screen displaying information about the parameters set for Cleaning In Place and Sterilization In Place. Further screens enable you to make changes to these parameters. (The screen you open is Screen 32 on Page 98.)

Screen 31: [*Sensor*] → Tools → Measurement → Measurement data

Screen name: [Sensor type] / [Sensor ID] / Measurement data

Purpose: Displays primary and secondary parameter measurements of the associated sensor (pH, dissolved oxygen, conductivity, temperature). In addition, also shows the underlying measurement parameters from which the primary parameters are calculated. The fields shown on this screen depend on the type of sensor to which they refer and to the level of the operator accessing them.

Comments: For more information, see the sensor manuals and programmer's manuals listed in Appendix A.5, on Page 137.

Screen 32: [*Sensor*] → Tools → Measurement → CIP/SIP definition

Screen name: [Sensor type] / [Sensor ID] / CIP/SIP definition

Purpose: Displays the current definition of parameters defining the Cleanings In Place (CIPs) and Sterilizations In Place (SIPs) events. Specialists can make changes to parameter values.

Comments: For more information about CIPs and SIPs, see Section 1.5.7, *ARC sensors: Cleanings and Sterilizations In Place*, on Page 31.

SIP min. temperature **120°C**	Displays the minimum temperature at which a Sterilization In Place event is recognized by the sensor selected on the Handheld. SIPs below this temperature, as measured by the sensor, are not counted. Click OK to access a screen enabling you to set a different value for this parameter.
SIP max. temperature **135°C**	Displays the maximum temperature at which a Sterilization In Place event is recognized by the sensor selected on the Handheld. SIPs above this temperature, as measured by the sensor, are not counted. Click OK to access a screen enabling you to set a different value for this parameter.

SIP min. time span **30 min**	Displays the minimum time period over which a Sterilization In Place event is recognized by the sensor selected on the Handheld. SIPs that take place over a shorter period, as measured by the sensor, are not counted. Click OK to access a screen enabling you to set a different value for this parameter.
CIP min. temperature **80°C**	Displays the minimum temperature at which a Cleaning In Place is recognized by the sensor selected on the Handheld. CIPs below this temperature, as measured by the sensor, are not counted. Click OK to access a screen enabling you to set a different value for this parameter.
CIP max. temperature **100°C**	Displays the maximum temperature at which a Cleaning In Place event is recognized by the sensor selected on the Handheld. CIPs above this temperature, as measured by the sensor, are not counted. Click OK to access a screen enabling you to set a different value for this parameter.
CIP min. time span **30 min**	Displays the minimum time period over which a Cleaning In Place event is recognized by the sensor selected on the Handheld. CIPs that take place over a shorter period, as measured by the sensor, are not counted. Click OK to access a screen enabling you to set a different value for this parameter.

Screen 33: [*Sensor*] → Tools → Measurement → Graph/data log

Screen name: [Sensor type] / [Sensor ID] / Graph/data log

Purpose: Displays a graph for real-time measurements. This is similar to Screen 19 on Page 79: [Sensor] → View → Graph..
Additionally, a trace file will be generated. For more information about trace files, see Task 5, *Managing trace files*, on Page 53.

Screen 34: [*Sensor*] → Tools → Calibration

Screen name: [Sensor type] / [Sensor ID] / Calibration

Purpose: Enables Administrators and Specialists to perform sensor calibrations and view the corresponding data.

Comments: None.

Calibration data	Click OK to access a screen displaying the calibration values set for calibration of the primary parameter of the sensor now selected on the Handheld. Further screens give full details of all parameter values at the time of the last calibration. (The screen you open is Screen 35 on Page 101.)
Calibrate	Click OK to access a screen enabling you to calibrate the primary parameter of the sensor now selected on the Handheld. (The screen you open is Screen 38 on Page 106.)

Screen 35: [*Sensor*] → Tools → Calibration → Calibration data

Screen name: [Sensor type] / [Sensor ID] / Calibration data

Purpose: Displays calibration data from the most recent sensor calibration. Further screens enable access to fuller details of the calibration.

Comments:
- Calibration of a sensor involves taking two sensor measurements, each with the sensor exposed to different conditions. These two sets of data associated with the two stages of calibration are referred to as Calibration data: point 1 and point 2. (Note that there is only one calibration point for conductivity sensors.)
- An additional calibration, Product Calibration, can also be performed. This adds an adjustment to a sensor that is already correctly calibrated, to compensate for the precise conditions of a sensor in a product, in a process.
- For information about calibration, see Section 1.5.4, *ARC sensors: two kinds of calibration*, on Page 23, and Task 2, *Calibrating a sensor*, on Page 41.

Calibration data: point 1 **0.00%-vol**	Displays, for the sensor now selected on the Handheld, the units and the value measured for the primary parameter at the Calibration data: point 1 stage of the sensor's last calibration. In the example shown here, the dissolved oxygen sensor was calibrated in an environment of nominally 0.00%-vol. (Failure to do this leads to failed calibration. Other sensors allow more choices of calibration standards.) Click OK to access a screen displaying full details of the last calibration. (The screen you open is Screen 36 on Page 103). **NOTE:** For information, see Section 1.5.4, *ARC sensors: two kinds of calibration*, on Page 23.
Calibration data: point 2 **20.95%-vol**	Displays the upper value at which the primary parameter of the sensor now selected on the Handheld was calibrated. **NOTE:** For more information, see Calibration data: point 1 shown above.

Calibration data: product	20.03%-vol

Displays, for the sensor now selected on the Handheld, the value and units measured for the last product calibration.

Alternatively, `inactive` indicates that no product calibration is currently active.

Click OK to access a screen displaying full details of the last product calibration.

(The screen you open is Screen 37 on Page 105).

NOTE: For information about product calibration, see *Product calibration*, on Page 44.

Standard set	HAMILTON

This field is not displayed for dissolved oxygen sensors because they do not require commercial standards for calibration.

Displays the standards set currently active for the sensor now selected on the Handheld. This information is held in memory on the sensor.

Specialists can select the standards set to be used to calibrate the sensor in Screen 38 on Page 106.

NOTE: For information about standards, see:

- Table 2.2, *Sensor calibration standards*, on Page 42.
- Sub-Task 3.5, *Configuring a calibration*, on Page 51.

Screen 36: [*Sensor*] → Tools → Calibration → Calibration data → Calibration data: point 1 [or point 2]

Screen name: [*Sensor type*] / [*Sensor ID*] / Calibration data: point 1 (or point 2)

Purpose: Displays data set by the operator and measured data associated with a sensor's last point 1 or point 2 calibration.

Comments: Only Administrators and Specialists can access this screen.

Measured value **70.99°**	Displays, for the sensor now selected on the Handheld, the value and units underlying the primary parameter, as measured by the sensor at Calibration data: point 1 (or point 2) of the sensor's last calibration. • For dissolved oxygen sensors, the underlying primary parameter is the phase difference between the excitation source and fluorescent signals, as shown in the example here. The DO reading is derived from this phase difference. • For pH sensors, the underlying primary parameter is the electrical potential between the reference and the measurement electrode. The pH reading is derived from this potential. • For conductivity sensors, the underlying primary parameter is the impedance between the measuring electrodes. The conductivity reading is derived from this impedance. The difference between ideal (theoretical) parameters and the calibration readings is an indication of the wear on the sensor, and is the basis for the HAMILTON Quality indicator measure.
Calibration point **0.00%-vol**	Displays, for the sensor now selected on the Handheld, the value and units set for calibration of the primary parameter at calibration point 1 (or point 2) of the sensor's last calibration. In the example shown on the left, the dissolved oxygen sensor was calibrated in an environment of nominally 0.00%-vol.

Temperature **26.85°C**	Displays, for the sensor now selected on the Handheld, the temperature recorded by the sensor at calibration point 1 (or point 2) of the sensor's last calibration. In the example shown on the left, the dissolved oxygen sensor was calibrated at a temperature of 26.85°C. **NOTE:** This value is measured and recorded by the sensor during calibration. This value is not set prior to calibration.
Airpressure **1013.00 mbar** **This field is shown only for the dissolved oxygen sensor**	**NOTE:** This field applies to the dissolved oxygen sensor only. Displays, for the DO sensor now selected on the Handheld, the air pressure set for the process environment at calibration point 1 (or point 2) of the sensor's last calibration. (A Specialist sets this on Screen 30 on Page 95.) **NOTE:** This value is set prior to calibration. This value is not measured or recorded by the sensor during calibration. (However, during calibration, the value for pressure is used as a correction factor to calculate the oxygen partial pressure).
Salinity **0.00 mS/cm** **This field is shown only for the dissolved oxygen sensor**	**NOTE:** This field applies to the dissolved oxygen sensor only. Displays, for the DO sensor now selected on the Handheld, the salinity set for measurements in solutions (A Specialist sets this on Screen 30 on Page 95.) **NOTE:** This value is set prior to calibration. This value is not measured or recorded by the sensor during calibration.
Operating hours **0.42 h**	Displays, for the sensor now selected on the Handheld, the total number of sensor operating hours recorded by the sensor during its life. This value acts as a time stamp to mark the time at which the calibration takes place. **NOTE:** This value is recorded by the sensor.

Zero point (+25°C)	Displays, for the sensor now selected on the Handheld, the value and units of the sensor's first characteristic parameter: • DO sensor: Phase signal value at zero oxygen. • Conductivity sensor: Impedance offset. • pH sensor: Isopotential point at pH=7.0. This figure acts as a performance reference value for the sensor. **NOTE:** This value is calculated from a measurement during calibration, and recorded by the sensor.
Sensitivity (25°C)	Displays, for the sensor now selected on the Handheld, the value and units of the sensor's second characteristic parameter: • DO sensor: Stern-Volmer coefficient. • Conductivity sensor: Cell constant. • pH sensor: Slope of pH calibration curve. This figure acts as a performance reference value for the sensor. **NOTE:** This value is calculated from a measurement during calibration, and recorded by the sensor.

Screen 37: `[Sensor]` → `Tools` → `Calibration` → `Calibration data` → `Calibration data: product`

Screen name: [*Sensor type*] / [*Sensor ID*] / Calibration data: product

Purpose: Displays both data set by the operator and measured data associated with the sensor's last product calibration. Data is recorded by the sensor.

Comments: This screen is identical to Screen 36 on Page 103, except that it is for Calibration data: product, not for Calibration data: point 1 or point 2.

Screen 38: [*Sensor*] → Tools → Calibration → Calibrate

Screen name: [*Sensor type*] / [*Sensor ID*] / Calibrate

Purpose: Enables automatic standard calibration of sensors.

Comments:
- Only Administrators and Specialists can access it.
- Neither this screen or any other enables the setting of calibration values.
- For information about calibration, see Section 1.5.4, *ARC sensors: two kinds of calibration*, on Page 23, and Task 2, *Calibrating a sensor*, on Page 41.

Calibrate at point 1	0.00%-vol

Displays, for the sensor now selected on the Handheld, the value and units set for the last calibration. This is dependent on the standards set selected. (See the *Select standard set* field on Screen 38, Page 107, and Sub-Task 3.5, *Configuring a calibration*, on Page 51.)

NOTE: For successful calibration, one calibration standard from a predefined set suitable for the sensor must be used. The sensor automatically recognizes the standard and allows the calibration. In the example shown here, the dissolved oxygen sensor must be in an environment of 0.00% oxygen.

Click OK to calibrate the sensor at Calibration point 1. The sensor performs the calibration immediately and the Handheld displays a screen informing you whether the calibration was successful or not.

NOTE: If calibration fails at one of the calibration points, the sensor can still be used. However, the measured value can be compromised. Measurement reliability is expressed as the Quality indicator field in Screen 20 on Page 80.

NOTE: The calibration procedure will last up to 180 seconds. If the standard is not recognized or the values are not stable, calibration will be cancelled automatically with a corresponding warning message.

NOTE: If calibration fails, a warning message is displayed. For more information, see Section 4.4.3, *Calibration status messages*, on Page 128.

NOTE: For more information, see:
- Section 1.5.4, *ARC sensors: two kinds of calibration*.
- Section 4.4.2, *Calibration warnings*
- Section 4.5.2, *Calibration errors*

Calibrate at point 2	20.95%-vol

All information is as for `Calibration at point 1` shown above.

Product calibration	init

Click OK to access a screen enabling you to adjust the measurement of the correctly-calibrated sensor now selected on the Handheld to the specific process conditions in which it is now functioning.

This optimizes the accuracy of the sensor reading for the conditions in which it is calibrated.

NOTE: The sensor must have a correct automatic standard calibration for product calibration to be of significant value. If necessary, perform `Calibrate at point 1` and `Calibrate at point 2` before performing the product calibration.

(The screen you open is Screen 36 on Page 103).

For general information, see *Product calibration*, on Page 44.

Select standard set	HAMILTON

This field is not displayed for DO sensors, as they do not require commercial standards for calibration.

Displays the standards set currently active for the sensor now selected on the Handheld.

Click OK to access a screen enabling you to select the standards set with which you intend to calibrate the sensor in future. (This screen is very simple and intuitive, and is not documented separately below.)

NOTE: The standards sets with which you can calibrate the sensor are sensor dependent, and the list you see is read from the sensor, in which the information is encoded during production. For more information, see:

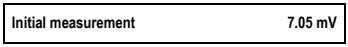
- Table 2.2, *Sensor calibration standards*, on Page 42.
- Sub-Task 3.5, *Configuring a calibration*, on Page 51.

Screen 39: [*Sensor*] → Tools → Calibration → Calibrate → Product calibration

Screen name: [*Sensor type*] / [*Sensor ID*] / Product calibration

Purpose: Enables Specialists to adjust the measurement of a correctly-calibrated ARC Sensor to specific process conditions. This optimizes the accuracy of the primary sensor reading (pH, conductivity, or dissolved oxygen) for the conditions in the process environment at the time of calibration. Note that the temperature reading of a sensor cannot be adjusted in this manner.

Comments: This screen is password protected. Only Administrators and Specialists can access it.



For the sensor now selected in the Handheld, displays the status of the initial measurement of the product calibration procedure. The status can be:

- inactive
  This shows that no initial measurement has been made, or that the initial measurement has been deleted from memory on the sensor by using Cancel below. This means that product calibration is not active, and the measurement displayed on the Handheld for the sensor's primary parameter is affected only by the automatic standard calibration.
- [*value unit*]
  This shows that an initial measurement has been made, and is in memory in the sensor. The unit and the value depend on the sensor type and the condition of the process, respectively.
  Note that the units are not those of the sensor's named primary measurement: pH, dissolved oxygen, or conductivity. Instead, they are the units of the underlying measurement, from which the primary measurement is derived:
  Visiferm DO (dissolved oxygen): degrees °
  pH: mV
  Cond (conductivity):

Click OK to perform the initial measurement. This records the value that the sensor is currently reading. This is held in the memory of the sensor for future reference.

For more information, see:

- *Automatic standard calibration*, on Page 42.
- *Product calibration*, on Page 44.

Assignment **init** **This field is only displayed if an initial measurement has been performed**	Displays the status of the primary parameter assigned to the `Initial measurement`. The possibilities are: • `inactive` This shows that product calibration is not active, although there is an `Initial measurement` stored in the sensor's memory. This means that the measurement displayed on the Handheld for the sensor's primary parameter is adjusted only by the automatic standard calibration. • `init` This shows that no value (for the sensor's primary parameter) has been assigned to the `Initial measurement`. This means that product calibration is not active, and the measurement displayed on the Handheld for the sensor's primary parameter is adjusted only by the automatic standard calibration. • [*`value unit`*] This shows that a value for the sensor's primary parameter (pH, dissolved oxygen, or conductivity) has been assigned to the `Initial measurement`. An adjustment for product calibration is being made to the measurement displayed in the Handheld for the sensor's primary parameter. If necessary, click OK to assign a value for pH, dissolved oxygen, or conductivity to the `Initial measurement`. When you do this, you activate product calibration. (The screen you open is very simple and intuitive, and is not documented separately below.)
Cancel **This field is only displayed if an initial measurement has been performed**	Click OK to delete the `Initial measurement` from the memory of the sensor. This inactivates product calibration.

Screen 40: [*Sensor*] → Tools → Sensor status

Screen name: [*Sensor type*] / [*Sensor ID*] / Sensor status

Purpose: Enables access, both directly and through further screens, to information about the current operating status of the sensor. For instance, operating hours, calibration status, and warning and error messages can be viewed.

Comments: This screen is identical to Screen 20 on Page 80: [Sensor] → View → Sensor status. See this screen for description.

Screen 41: [*Sensor*] → Tools → Interface configuration

Screen name: [*Sensor type*] / [*Sensor ID*] / Interface configuration

Purpose: Enables Specialists to change the configurations of the interfaces using further screens.

Comments:
- This screen is password protected. Only Specialists can access it.
- A sensor's analog interfaces are for communication between the sensor and the analog PLC system, not for sensor/Handheld communication.
- By default, mA interface #1 is for the primary measurement parameter (dissolved oxygen, conductivity, or pH), and mA interface #2 is for the secondary parameter (temperature). However, Specialists can change this default by mapping measurement parameters to either interface. (See Screen 45 on Page 115: [Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration.)
- A sensor's digital interface is for communication between the sensor and Handheld, personal computer (PC), or digital PLC.

Digital RS485	Click OK to access further screens enabling you to configure the RS485 digital interface for the sensor now selected on the Handheld. (The screen you open is Screen 42 on Page 112.)

mA interface #1 **4–20mA linear** **This field is different for DO sensors**	Displays, for the sensor now selected on the Handheld, the interface mode currently set for mA interface #1 (or for the only analog interface, `mA/ECS-Interface`, of the VISIFERM DO ARC sensor). Click OK to access further screens enabling you to configure the analog interface. (The screen you open is Screen 43 on Page 113.) **NOTE:** For more information about interface modes, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.
mA interface #2 **4–20mA linear** **This field not shown for DO sensors**	**NOTE:** This field is not applicable to the VISIFERM DO (non-ARC) sensor, because it does not have an analog interface of this kind. It is also not applicable to the VISIFERM DO ARC sensor, because it does not have a second analog interface. Displays, for the sensor now selected on the Handheld, the interface mode currently set for mA interface #2. Click OK to access further screens enabling you to configure the analog interface. (The screen you open is Screen 44 on Page 114.) **NOTE:** For more information about interface modes, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.

Screen 42: [*Sensor*] → Tools → Interface configuration → Digital RS485

Screen name: [*Sensor type*] / [*Sensor ID*] / Digital RS485

Purpose: Enables Specialists to configure the digital interface of a sensor.

Comments:
- This screen is password protected. Only Specialists can access it.
- A sensor's digital interface is for communication between the sensor and Handheld, personal computer (PC), or digital PLC.
- A similar screen, Screen 24 on Page 86: [Sensor] → View → Interface configuration → Digital RS485, also explains the same fields.

Baud rate 19200	Displays the Baud rate of the digital interface of the sensor that is selected on the top level of the Handheld's user interface. Click OK to access a screen enabling you to select a different Baud rate. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For more information about Baud rates, see Section 1.5.5.3, *Baud rates*.
Modbus device address 1	Displays the Modbus device address of the sensor now selected on the Handheld. Click OK to access a screen enabling you to select a different Modbus device address. (This screen is very simple and intuitive, and is not documented separately below.) **NOTE:** For more information about Modbus device addresses, see Section 1.5.5.2, *Modbus device addresses*.
Parity none	Displays the parity status of the RS485 interface. (This value is required for programming the PLC.) Operators cannot change this status.
Stop bits 2	Displays the number of stop bits set for the RS485 interface. (This value is required for programming the PLC.) Operators cannot change this status.

Screen 43: [*Sensor*] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface]

Screen name: [*Sensor type*] / [*Sensor ID*] / Analog 1 (or 2)

Purpose: Enables access to further screens to configure the sensor's mA interface #1 interface. Specialists only can perform configurations.

Comments:
- A sensor's analog interfaces are for communication between the sensor and the analog PLC system, not for sensor/Handheld communication.
- This screen is very similar to Screen 25 on Page 87: [Sensor] → View → Interface configuration → mA interface #1 [or #2].

Interface mode **4–20mA linear**	Displays, for the sensor now selected on the Handheld, the interface mode currently set for mA interface #1 (or in the case of the VISIFERM DO ARC sensor, the only analog interface). Click OK to access a screen enabling you to select a different interface mode. (The screen you open is Screen 44 on Page 114.) **NOTE:** For more information about interface modes, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.
Output current configuration	Click OK to access a screen enabling you to map: • Analog interface output values to • Measurement parameter values for mA interface #1 of the sensor now selected on the Handheld. (The screen you open is Screen 45 on Page 115.)
Error/warning configuration	Click OK to access a screen enabling you to map: • Analog interface output values to • Errors and warnings for mA interface #1 of the sensor now selected on the Handheld. (The screen you open is Screen 46 on Page 118.)

Screen 44: [*Sensor*] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Interface mode

Screen name: None.

Purpose: Enables Specialists to configure the sensor's mA interface #1 or mA interface #2 (or the only analog interface in the case of the VISIFERM DO ARC sensor) that was selected in Screen 41 on Page 110: [Sensor] → Tools → Interface configuration.

Comments:
- A sensor's analog interfaces are for communication between the sensor and the process control system, not for sensor/Handheld communication.
- This screen is password protected. Only Specialists can access it..

OFF	Click OK to switch off the analog interface. No signals are sent from the analog interface chosen on Screen 41.
4–20 mA fixed	Click OK to make the analog interface chosen on Screen 41 send a continuous fixed signal for test purposes. **NOTE:** The parameters of this test signal are defined on Screen 45 on Page 115.
4–20 mA linear	Click OK to enable mapping of the analog interface chosen on Screen 41, using two data points. In this kind of correlation, the two points become the ends of a straight-line graph that determines the relationship between: • The value measured by the sensor immersed in the process, for instance, the pH value. • The 4–20 mA output of the analog interface. (The mapping of sensor outputs to interface outputs is defined on Screen 45 on Page 115.) **NOTE:** For more information about linear and bilinear interface configuration, see Section 1.5.6, *ARC sensors: analog interface configuration*, on Page 26.

4–20 mA bilinear

Click OK to enable mapping of the analog interface chosen on Screen 41, using three points.

In this kind of correlation, the three datum points define the two straight lines of a graph that determines the relationship between:

- The value measured by the sensor immersed in the process, for instance, the pH value.
- The 4–20 mA output of the analog interface.

(The mapping of sensor outputs to interface outputs is defined on Screen 45 on Page 115.)

NOTE: For more information about linear and bilinear interface configuration, see Section 1.5.6, *ARC sensors: analog interface configuration*, on Page 26.

Screen 45: [*Sensor*] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration

Screen name: [*Sensor type*] / [*Sensor ID*] / Configuration output current

Purpose: Enables mapping of the sensor output to the analog interface output for the analog interface chosen on Screen 41 on Page 110: [Sensor] → Tools → Interface configuration.

Comments:

- This screen is not password protected. All users can access it. However, only Specialists can access underlying screens to make changes.
- A sensor's analog interfaces are for communication between the sensor and the process control system, not for sensor/Handheld communication.
- The fields displayed on this screen depend on the sensor connected and the choices made in Screen 43 on Page 113. This section shows all possible fields.
- Additionally, Screen 46 on Page 118 enables configuration of a sensor's analog interface output in response to warning and error conditions.

Interface mode	4–20mA linear

Displays the interface mode of the analog interface chosen on Screen 41, for the sensor now selected on the Handheld.

(Specialists can select an interface mode for an interface on Screen 43 on Page 113.)

NOTE: For more information, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.

Measurement variable	DO

Only Specialists can access underlying screens.

Displays a symbol representing the measurement variable that is now mapped to the analog interface chosen on Screen 41.

Click OK to access a screen enabling you to map a variable to the chosen interface. (This screen is very simple and intuitive, and is not documented separately below.)

Naturally, you can only map a variable supported by the sensor selected on the Handheld.

NOTE: It is possible to map the same measurement variable to both mA interface #1 and to mA interface #2. In this way, two different views of the same variable are possible by configuring the analog interfaces differently. You can do this on the fields below.

Value at 4 mA	0%-vol

Only Specialists can access underlying screens.

Displays, for the analog interface chosen on Screen 41, the current mapping between:

- The lowest output current (4 mA) of the analog interface.
- A measurement parameter value.

In the example shown on the left, a dissolved oxygen value of 0% by volume causes the sensor to output a current of 4 mA.

Click OK to access a screen enabling you to map a different measurement parameter value to the interface's lowest output. (This screen is very simple and intuitive, and is not documented separately below.)

NOTE: For more information, see Section 1.5.6, *ARC sensors: analog interface configuration*.

Value at 20 mA	**60.5%-vol**

Only Specialists can access underlying screens.

Displays, for the analog interface chosen on Screen 41, the current mapping between:

- The highest output current (20 mA) of the analog interface.
- A measurement parameter value.

In the example shown on the left, a dissolved oxygen value of 60.5% by volume causes the sensor to output a current of 20 mA.

Click OK to access a screen enabling you to map a different measurement parameter value to the interface's highest output. (This screen is very simple and intuitive, and is not documented separately below.)

For more information, see Section 1.5.6, *ARC sensors: analog interface configuration*.

Active output signal	**14.1 mA**

Displays the current that the analog output of the interface chosen on Screen 41, for the sensor now selected on the Handheld, is outputting now.

This current is for the measurement parameter set in the `Measurement variable` field shown above.

NOTE: The value shown is valid and accurate only when the output is correctly connected to an analog PLC.

Screen 46: [*Sensor*] → Tools → Interface configuration → mA interface #1 [or #2] → Error/warning configuration

Screen name: [*Sensor type*] / [*Sensor ID*] / Configuration error / warning

Purpose: Enables configuration of a sensor's analog interface output in response to warning and error conditions. Specialists only can configure values.

Comments:
- A sensor's analog interfaces are for communication between the sensor and the analog PLC system, not for sensor/Handheld communication.
- This screen functions together with Screen 45 on Page 115: [Sensor] → Tools → Interface configuration → mA interface #1 [or #2, or mA/ECS-Interface] → Output current configuration, in which readings from the sensor's measurement are mapped to analog output currents.

Interface mode **4–20 mA linear**	Displays the interface mode set for the analog interface chosen on Screen 41, for the sensor now selected on the Handheld. (Specialists can set the interface mode on Screen 43 on Page 113.) **NOTE:** For more information about interface modes, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*.
Mode in event of warning **No output**	Displays the response of the analog interface chosen on Screen 41 for a warning message. The analog interface can be configured to send a warning (or error) status signal to the process control system in one of three ways: • Continuous: The analog interface sends a continuous signal to the process control system. • Alternating: The analog interface sends a square wave signal to the process control system. • No output: The analog interface sends no signal to the process control system. Click OK to access a screen that enables you to change the Mode in event of warning. (This screen is very simple and intuitive, and is not documented separately below.)
Mode in event of error **Continuous**	Displays the response of the analog interface chosen on Screen 41 for an error message. For more information, see Mode in event of warning shown above.

Output in event of warning **21mA**	Displays, for the analog interface chosen on Screen 41, the current corresponds to a warning status. During the time a warning status is in force: • The interface responds according to the `Mode in event of warning` field (see above). • An appropriate warning message is generated, and can be viewed on the Handheld. For more information, see Section 4.4, *Troubleshooting warning and status messages*, on Page 127.
Output in event of error **22mA**	Displays, for the analog interface chosen on Screen 41, the current corresponds to an error status. During the time an error status is in force: • The interface responds according to the `Mode in event of error` field (see above). • An appropriate error message is generated, and can be viewed on the Handheld. For more information, see Section 4.4, *Troubleshooting warning and status messages*, on Page 127.
Output for T out of limit **3mA**	Displays, for the analog interface chosen on Screen 41, the output current to indicate that temperature is above its accepted range. In this way, you can use the temperature measurement as an alarm device. **NOTE:** All ARC sensors have a temperature measurement function.

Screen 47: [*Sensor*] → Tools → Data management

Screen name: [*Sensor type*] / [*Sensor ID*] / Data management

Purpose: Enables Specialists to copy a sensor STAtus profile (STA) or a Sensor Configuration File from the sensor to the Handheld, to update the sensor's firmware, to change the passwords for Aministrators and Specialists on the sensor and to restore the factory settings.

Data transfer (Sensor to ARC View)	Enables you to create a sensor STAtus profile (STA) or a Sensor Configuration File from the sensor now selected on the Handheld. The file gets stored in the memory in the Handheld. Click OK to access an intermediary screen that allows you to select if a STA file or Sensor Configuration File should be stored on the Handheld. Click OK again to create the STA file or Sensor Configuration File on the Handheld. **NOTE:** If the memory of the Handheld is full, the oldest files will be overwritten by the latest ones. ARC View Handheld can store at most 16 files per file type. Maximum size for a single file is 256 kb. **NOTE:** For more information about sensor STAtus profiles, see Task 4, *Managing sensor STAtus profiles*, on Page 51. **NOTE:** For more information about Sensor Configuration Files, see Task 6, *Managing Sensor Configuration Files*, on Page 55.
Data transfer (ARC View to Sensor)	Enables you to load a configuration profile on the sensor. **NOTE:** Sensor Configuration Files are a powerful tool. Erroneous use may lead to corrupted sensor configuration and malfunction in the application. Thoroughly check newly configured sensors before using them in your application. If they do not work as intended, review and correct the complete sensor configuration manually.

Firmware update sensor **This field is shown only when the Handheld is in the Dock.**	Enables you to copy a firmware update file from a memory stick inserted in the Dock to a sensor. **NOTE:** The Handheld must be in the Dock, and a memory stick with a suitable file must also be inserted in the USB slot in the Dock. Click OK to perform the firmware update. Status screens keep you informed of progress. **NOTE:** For more information, see Appendix B.5, *ARC sensor firmware update*.
Change password	Enables you to change the password for operator level Administrator (A) or Specialist (S). Click OK to access a screen on which you can select one of the following: • `Change password for A:` Click OK for a screen for entering the new password. You will be asked to enter the password a second time for confirmation. • `Change password for S:` Click OK for a screen for entering the new password. You will be asked to enter the password a second time for confirmation.
Restore factory settings	Enables you to set the ARC View Handheld back to factory settings. Click OK to access a screen on which you confirm that the configuration should be reset to factory settings. **NOTE:** If you restore the factory default settings, all settings you you customized on your device will be lost. For more information about restoring the factory settings, see Section 4.6, *Restore Factory Settings*, on Page 132.

Screen 48: [*Sensor*] → Tools → Sensor info

Screen name: [*Sensor type*] / [*Sensor ID*] / Sensor info

Purpose: Enables access to manufacturing information uniquely identifying a sensor. Enables Specialists to change the Sensor ID.

Comments:
- All operators can access this screen. However, only Specialists can change the Sensor ID.
- This screen is almost identical to Screen 22 on Page 84: [Sensor] → View → Sensor info. The only difference is that here in screen 48, Specialists can change the Sensor ID.

Sensor ID	**242450-3001**

Displays a string identifying the sensor now selected on the Handheld. By default, the string is the sensor's part number followed by its serial number.

Click OK to access a screen on which you can change the Sensor ID string. (This screen is very simple and intuitive, and is not documented separately below.)

All fields in the middle of the screen are the same as Screen 22 on Page 84: [Sensor] → View → Sensor info.

ARC Wi info

This field is displayed only when the sensor selected on the Handheld is communicating with the Handheld in wireless mode.

Click OK to access a screen of information about the ARC Wi Sensor Adapter fitted to the sensor now selected on the Handheld.

(The screen you open is Screen 46 on Page 118.)

Screen 49: [*Sensor*] → Tools → Sensor info → ARC Wi info

Screen name: [*Sensor type*] / [*Sensor ID*] / ARC Wi info

Purpose: Enables access to manufacturing information uniquely identifying an ARC Wi Sensor Adapter. No fields can be modified by operators.

Comments:
- This screen is available only when the sensor selected on the Handheld is communicating with the Handheld in wireless mode. Wireless mode is in force when the Handheld is not in the Dock, assuming that default wireless settings are in operation. (See the *Wireless settings* field on Screen 15, Page 75.)
- All operators can access this screen.

ARC Wi firmware version **WI0MS006**	Displays the version of the firmware currently loaded on the printed circuit board of the ARC Wi Sensor Adapter connected to the sensor selected on the Handheld. For information about updating firmware, see Appendix B.5, *ARC sensor firmware update*, on Page 143.
ARC WiRF address **59560115**	Displays the ARC hardware address of the radio module in the ARC Wi Sensor Adapter connected to the sensor selected on the Handheld. This value is set in the factory and cannot be changed.
Serial number **0015**	Displays the serial number of the ARC Wi Sensor Adapter connected to the sensor selected on the Handheld. This value is set in the factory, and cannot be changed.
Workorder number **2091323**	Displays the workorder number of the ARC Wi Sensor Adapter connected to the sensor selected on the Handheld. This number can be useful in tracing faulty ARC Wi Sensor Adapters to production runs. This value is set in the factory and cannot be changed.
Part number **242170/80**	Displays the part number of the ARC Wi Sensor Adapter connected to the sensor selected on the Handheld.
Productname **ARC WI**	Displays the product name of the ARC Wi Sensor Adapter connected to the sensor selected on the Handheld.

Serial number PCB **0327615**	Displays the serial number of the printed circuit board in the ARC Wi Sensor Adapter connected to the sensor selected on the Handheld. This value is set in the factory, and cannot be changed.
RF frequency **2.4245 GHz**	Displays the active communication frequency.

Section 4 Troubleshooting

This section lists all warning and error messages and describes the troubleshooting procedures.

Section 4.1 Troubleshooting Wi wireless connections

Indicator status		Comments
	No connection between the handheld and the selected sensor is not possible, wireless or wired.	The connection (wireless or wired) between your handheld and the sensor is temporarily or permanently lost. This can be because: • The sensor is out of range. • There is digital interference. • The sensor or sensor's digital interface is not functioning properly.
	Wireless connection between the Handheld and the selected sensor is very poor or non-existent. Wired connection, if present, is OK.	The Handheld is in its Dock (wired connection) or the wireless signal strength for the selected sensor is zero. Move closer to the sensor of interest in order to make communication possible.
	Wireless signal strength is poor.	The distance between your handheld and the selected sensor is at the limit for reliable communication. Move closer to the sensor of interest in order to improve communication quality.
	Wireless signal strength is acceptable.	The distance between handheld and the sensor of interest is still acceptable. In order to improve reliable data communication move closer to the sensor of interest.
	Wireless signal strength is excellent.	The wireless signal performance is excellent. You are in good distance to the sensor of interest to ensure reliable data communication.

Table 4.1 Troubleshooting a faulty wireless connection

Section 4.2 Troubleshooting Handheld sensor status colors

Indicator status	Comments
 Status symbol on the Handheld for a sensor is green	The connectivity to the sensor is OK. The sensor is running correctly and has no warnings and errors. (Flashing green indicates that the Handheld is being updated now with data from a correctly-functioning sensor. This is normal.)
 Status symbol on the Handheld for sensor is yellow	The connection to the sensor is OK. However, the sensor indicates some error or warning. To analyze the problem, go to `[Sensor]` → `View` → `Sensor status`. This screen indicates the reason for the yellow status symbol. Such a case is not communicated through the ARC Wi Sensor adapter. (Flashing yellow indicates that the Handheld is being updated with data from a sensor with a warning or error status.)
 Status symbol on the Handheld for a sensor is red	The ARC View Handheld lost connection to the sensor due to one of the following reasons: • The wireless signal strength is low. • The ARC Wi Sensor Adapter has been removed from the sensor. • The sensor is defective. In the first case, move closer to the sensor of interest. The latter cases are indicated, in addition, by a red light on the corresponding ARC Wi Sensor Adapter.

Table 4.2 Troubleshooting Handheld sensor status colors

Section 4.3 Troubleshooting ARC Wi Sensor Adapter status colors

Indicator status	Comments
ARC Wi Sensor Adapter illuminates red	If an ARC Wi Sensor Adapter is newly connected to a power supply the top illuminates red during initialization. After correct initialization of ARC Wi Sensor Adapter with an ARC Sensor connected, the red light disappears. If a red light persists there is either no sensor connected to the ARC Wi Sensor Adapter or the connected sensor is defective. Wait at least five minutes before assuming there is a problem. The ARC Wi Sensor Adapter requires time to scan through all possible Modbus device addresses at all possible Baud rates. If the problem persists, check for disconnects or defective sensors.
ARC Wi Sensor Adapter does not illuminate	This does not indicate necessarily a problem. Either the ARC Wi Sensor Adapter and ARC Sensor are not connected to a power source or they are functioning normally.
ARC Wi Sensor Adapter illuminates green	This does not indicate any problem. The sensor is actively selected on an ARC View Handheld device.

Table 4.3 Troubleshooting with status colors on the ARC Wi Sensor Adapter

Section 4.4 Troubleshooting warning and status messages

A warning is a notification message that allows further functioning of the ARC System. This type of message alerts operators to the potential for a problem with an ARC Sensor that could lead to incorrect results or errors.

Section 4.4.1 Measurement warnings

Measurement warnings are sensor-dependent.

Warning	Solution
Reading below lower limit	The currently measured value is out of the sensors measurement range. You are using the sensor off-specification.
Reading above upper limit	
Reading unstable (Standard deviation > 1%)	The sensor detects instability in measurement value. This can be the case if the sensing element is approaching end of life or if the current measurement conditions are unstable.

Table 4.4 Measurement warnings for DO ARC sensors

Warning	Solution
T reading below lower limit (T < Tmin, chapter 5.8.1)	The current temperature is out of the sensors temperature measurement range.
T reading above upper limit (T > Tmax, chapter 5.8.1)	
T reading unstable (Standard deviation > 1%)	The sensor detects instability in temperature measurement. This can be the case if the measurement conditions are unstable.

Table 4.4 Measurement warnings for DO ARC sensors

Section 4.4.2 Calibration warnings

Calibration warnings are sensor-dependent.

Warning	Solution
Calibration recommended	Perform a calibration in order to ensure reliable measurement.
Last calibration not successful	The last calibration at either calibration point failed. The sensor is using the last successful calibration. In order to ensure reliable measurement perform a calibration.
Replace sensor cap (DO only)	The sensor cap of VISIFERM DO ARC must be replaced and the sensor needs to be recalibrated with the new cap.

Table 4.5 Calibration warnings for ARC sensors

Section 4.4.3 Calibration status messages

Message	Solution
Calibration Point 1(2): Below calibration range	The measurement value is below/above the lower/upper limit of the sensors allowed calibration range.
Calibration Point 1(2): Above calibration range	Ensure stable measurement conditions and correct standards for calibration.
Calibration Point 1(2): Temperature too low	The measured temperature of your calibration standard is not in the allowed range for calibration.
Calibration Point 1(2): Temperature too high	To perform successful calibration ensure stable measurement conditions within the calibration range of the corresponding sensor.

Table 4.6 Calibration status messages for ARC sensors

Message	Solution
Calibration Point 1(2): Drift temperature	The measured temperature is not stable enough for calibration. Ensure stable measurement conditions. The sensor must be exposed to the applied calibration standard for a certain time in order to reach stability.
Calibration Point 1(2): Reading too low	The current sensor reading is too low/too high for the applied calibration standard. The sensor might be defective or reaching end of life or the applied calibration standard is not applicable to the selected calibration point.
Calibration Point 1(2): Reading too high	
Calibration Point 1(2): Drift reading	The current sensor reading is not stable enough for reliable calibration. Ensure stable calibration conditions. The sensor must be exposed for a certain time to the applied calibration standard in order to reach stability.
Calibration Point 1(2): Incorrect measurement unit	The selected measurement unit does not allow calibration of the sensor. Select the correct measurement unit Tools → Measurement.

Table 4.6 Calibration status messages for ARC sensors

Section 4.4.4 Interface warnings

NOTE: Interface warnings are for DO ARC sensors only.

Warning	Solution
Value below 4 mA	The measurement value exceeds the lower limit of the 4–20 mA interface output. To ensure correct current output for present measurement conditions reconfigure the sensors 4–20 mA interface accordingly Tools → Interface Configuration → Output current configuration.
Value above 20 mA	The measurement value exceeds the upper limit of the 4–20 mA interface output. Solution see above.
Current set point not met	The sensors 4–20 mA Interface is not able to regulate the current requested for the current measurement value according to your 4–20 mA Interface configuration. Check the 4–20 mA wiring and supply voltage.

Table 4.7 Interface warnings for DO ARC sensors

Warning	Solution
Supply voltage too low	The applied supply voltage of the sensors 4–20 mA Interface is too low/too high. Ensure correct power supply according to the sensors specifications.
Supply voltage too high	

Table 4.7 Interface warnings for DO ARC sensors

Section 4.4.5 Hardware warnings

NOTE: Hardware warnings are for DO sensors only.

Warning	Solution
Sensor supply voltage too low	The sensor supply voltage is too low/high for the sensor to operate correctly. Ensure stable supply voltage within the sensors specifications.
Sensor supply voltage too high	

Table 4.8 Hardware warnings for DO sensors

Section 4.5 Troubleshooting error messages

An error is a notification message that alerts operators to a problem that terminates subsequent functioning of the ARC System. Such a problem must be corrected before further processing is possible.

Section 4.5.1 Measurement errors

Measurement errors are sensor-specific.

The errors can not be resolved in each and every case. Replacement of the sensor might be necessary.

Error	Solution
Reading failure (all sensors)	The sensor can not perform measurement any more. This is the case if the sensors hardware or a sensing element is defective (for example, totally degenerated sensor cap for DO sensors, glass resistances which are out of acceptable range for pH sensors).
Glass resistance too high (pH only)	A pH sensors glass resistance is too high/too low (for example, broken glass electrode or dry sensor tip).
Glass resistance too low (pH only)	

Table 4.9 Measurement errors for ARC Sensors

Error	Solution
Reference resistance too high (pH only)	A pH sensors reference electrode shows a resistance off-specifications.
Reference resistance too low (pH only)	
Resistance 4 electrodes too high (Cond. only)	A Cond. Sensors 4 electrodes resistance is too high/too low (for example, short circuits or open circuits in the sensor, dry sensor tip). Ensure proper installation of the sensor.
Resistance 4 electrodes too low (Cond. only)	
Resistance 2 electrodes too high (Cond. only)	A Cond. Sensors 2 electrodes resistance is too high/too low. Ensure proper installation of the sensor.
Resistance 2 electrodes too low (Cond. only)	
Reference 2 potential too low (pHeasy only)	The difference between the check reference electrode and the reference electrode potentials is above 50 mV. This is caused by loss of Cl^- ions in the reference electrolyte. The electrodes expected life time is nearly reached.
Reference 2 potential too high (pHeasy only)	
T sensor defective	The sensor can not perform any temperature measurement any more. This is the case if the sensors temperature sensor is defective.

Table 4.9 Measurement errors for ARC Sensors

Section 4.5.2 Calibration errors

Calibration errors are sensor-dependent

Error	Solution
Sensor cap missing (DO only)	The DO sensors sensor cap has been removed. Do not place a sensor showing this error in a measurement solution. The sensor needs to be equipped with a sensor cap and calibrated in order to perform reliable measurement.
Sensor failure (pH and Cond. only)	The sensors quality indicator is too low. The active calibration is not reliable. Try recalibration of the sensor. If not possible the sensor reached end of life and needs to be replaced.

Table 4.10 Calibration errors for ARC sensors

Section 4.5.3 Hardware errors

Hardware errors are for all sensor types.

Error	Solution
Sensor supply voltage far too low (DO only)	The sensors supply voltage is smaller than 6 V. This is too low voltage for the sensor to operate correctly.
Sensor supply voltage far too high (DO only)	The sensors supply voltage is larger than 40 V. Operation under such conditions leads to permanent damage of the sensor.
Temperature reading far below min. (DO only)	The current temperature is at least 10 °C lower/higher than the VISIFERM DO ARC sensors specified minimum/maximum operating temperature. Operation of the sensor under such conditions leads to permanent damage of the sensor.
Temperature reading far above max. (DO only)	
Internal communication failure (pH and Cond. only)	The sensors internal communication failed. The sensor might be running under conditions of too high temperature or might have a hardware problem. Ensure operation under conditions such as specified for the specific sensor in use.

Table 4.11 Hardware errors for ARC sensors

Section 4.6 Restore Factory Settings

You can restore ARC sensors and ARC View Handheld to its original factory default settings. In order to perform this procedure you must have the “S” - specialist access on the corresponding ARC device.

To restore the factory settings, go to `[Sensor]` → `Tools` → `Data management` → `Restore factory settings` and click `OK`.

To restore the factory settings on ARC View Handhelt, go to `ARC View Handheld` → `Tools` → `Settings` → `Restore factory settings` and click `OK`.

NOTE: If you restore the factory default settings, all settings you customized on the device will be lost.

Appendix A ARC System components

This section lists all components in the HAMILTON ARC System, all associated documentation, and all part numbers.

Appendix A.1 HAMILTON ARC System core components

The core components of the HAMILTON ARC System are:

- ARC View Handheld and Dock.
  You can find specifications for these items in Table A.1, *ARC View Handheld specifications*.

- Power supply for Handheld and Dock.
  This unit requires a power source of 100 to 240 V, and has adapters for standard power sockets in Europe, Great Britain, Australia and the USA.

- ARC Cable VP 8.
  This is a data and power cable between a sensor and the Dock.

- ARC Wi Sensor Adapter. P/N 242 170.
  This item is mounted between the VP head of an ARC sensor and the VP sensor cable. It provides the wireless communication between the ARC sensor and ARC View Handheld.
  You require a minimum of one Sensor Adapter (although typically many more) for each ARC System.

- ARC sensor.
  At least one ARC sensor (although typically many more) is required for an ARC System. You can find details of ARC sensors in Appendix A.3, *HAMILTON ARC System additional components*.
  For more information about the components required to set up a HAMILTON ARC System, see Appendix A.4, *HAMILTON ARC System spare parts*.

Appendix A.2 HAMILTON ARC View Handheld specifications

Parameter	Value
Permissible operating temperature	+5 to +45°C
Maximum transmitting power	+0 dBm
Maximum data transmission rate	256 kbps
Communication protocol	Modbus RTU
Frequency range	2.45 GHz (IEEE 802.15.4)
Maximum range in open area	~100 m
Maximum range in process environment	~20 m
Dimensions (W x D x H)	140 x 35 x 85 mm
Weight	340 g

Table A.1 ARC View Handheld specifications

Parameter	Value
Power supply: • ARC View Dock power supply unit requirement • Continuous battery operation	 100 to 240 V 9 h
Protection rating	IP 67 (except ARC View Dock, power adapter, and VP 8 sensor cable)
USB interface	On ARC View Dock

Table A.1 ARC View Handheld specifications

Appendix A.3 HAMILTON ARC System additional components

Depending upon your ARC setup, you need a selection of the following components.

Component	Part Number	Comment
Easyferm Plus ARC 120	242 091	
Easyferm Plus ARC 225	242 092	
Easyferm Plus ARC 325	242 093	
Easyferm Plus ARC 425	242 094	
Polilyte Plus ARC 120	242 111	
Polilyte Plus ARC 225	242 112	
Polilyte Plus ARC 325	242 113	
Polilyte Plus ARC 425	242 114	
Easyferm Food ARC 120	242 120	
Easyferm Food ARC 225	242 121	
Easyferm Food ARC 325	242 122	
Easyferm Food ARC 425	242 123	
pHeasy ARC 120	242 154	
pHeasy ARC 225	242 155	

Table A.2 HAMILTON ARC System components

Component	Part Number	Comment
Conducell 4 USF ARC 120	242 159	
Conducell 4 USF ARC 225	242 160	
Conducell 4 USF ARC 325	242 161	
Conducell 4 USF ARC 425	242 162	
VISIFERM DO ARC 120	242 163	
VISIFERM DO ARC 225	242 164	
VISIFERM DO ARC 325	242 165	
VISIFERM DO ARC 425	242 166	
ARC View Handheld Package	242 180	
ARC Wi Sensor Adapter	242 170	

Table A.2 HAMILTON ARC System components

Appendix A.4 HAMILTON ARC System spare parts

The following spare parts for HAMILTON ARC System are available.

Document	Part Number	Comment
ARC View Handheld	242 167	
ARC View Handheld Dock	242 168	
ARC Memory Stick	396 230	
Accupack ARC View	242 057	For ARC View Handheld
Power supply	242 007	For ARC Handheld and Dock
ARC Cable VP8	242 176	

Table A.3 HAMILTON ARC System spare parts

Appendix A.5 HAMILTON ARC System documents

Depending upon your ARC process analytics setup, you need some or all of the following documents.

Document	Part Number	Comment
VISIFERM DO ARC Modbus RTU Programmer's Manual	624179	Describes in detail the VISIFERM DO ARC Modbus RTU interface. You require this document only if you must set up a PLC to operate with ARC sensors.
ARC Conductivity Sensor Modbus RTU Programmer's Manual	624299	
ARC pH Sensor Modbus RTU Programmer's Manual	624300	
ARC Sensor Configurator User Manual	624258	Describes in detail how to install and use the *ARC Sensor Configurator* freeware to calibrate, configure and test ARC sensors.
ARC pH Sensor Operating Instructions For the following: • EASYFERM PLUS ARC • EASYFERM FOOD ARC • POLILYTE PLUS ARC • PHEASY ARC	624263	Packed together with the sensor. Includes all details of sensor calibration.
CONDUCELL 4USF ARC Sensor Operating Instructions	624267	Packed together with the sensor. Includes all details of sensor calibration.
VISIFERM DO ARC Optical Oxygen Sensor Operating Instructions	624268	Packed together with the sensor. Includes all details of sensor calibration.
HAMILTON ARC System	691069	Marketing brochure for the HAMILTON ARC System. Contains a list of product names and order numbers.

Table A.4 HAMILTON ARC System documents

Appendix B ARC System firmware updates

This section explains how to update the firmware of all ARC System components:

- Appendix B.2, *Handheld firmware update*
- Appendix B.3, *Handheld RF Module firmware update*
- Appendix B.4, *Dock firmware update*
- Appendix B.5, *ARC sensor firmware update*
- Appendix B.6, *Wi Sensor Adapter firmware update*

Appendix B.1 Introduction

Firmware updates are available by agreement with HAMILTON AG. Typically, updates are delivered by internet. You then copy them to a suitable memory stick which you place in the USB socket in the Dock.

Appendix B.2, *Handheld firmware update*, on Page 140 gives a good overview of firmware updating.

NOTE:
- Updates can be performed only in wired configuration, in other words, with all devices connected by cable to the Dock.
- Perform updates on a tidy desktop in the laboratory or office, and not under process conditions.
- Strictly follow both the instructions on the Handheld screen, and the operating instructions in the sections following.
- Do not leave the system unattended during the update process.
- While an update is running, do not manipulate the system:
  Do not switch off power.
  Do not disconnect sensors or cables.
  Do not remove the Handheld from the Dock.
  Do not remove the USB stick.
- Before starting an update plug the USB stick containing the firmware files into the Dock. The USB stick must be FAT or FAT32 formatted, and must have no directory structure. Firmware files must be in the root folder. Only files which are valid for a the update type that you are performing are displayed by the ARC View Handheld.

Appendix B.2 Handheld firmware update

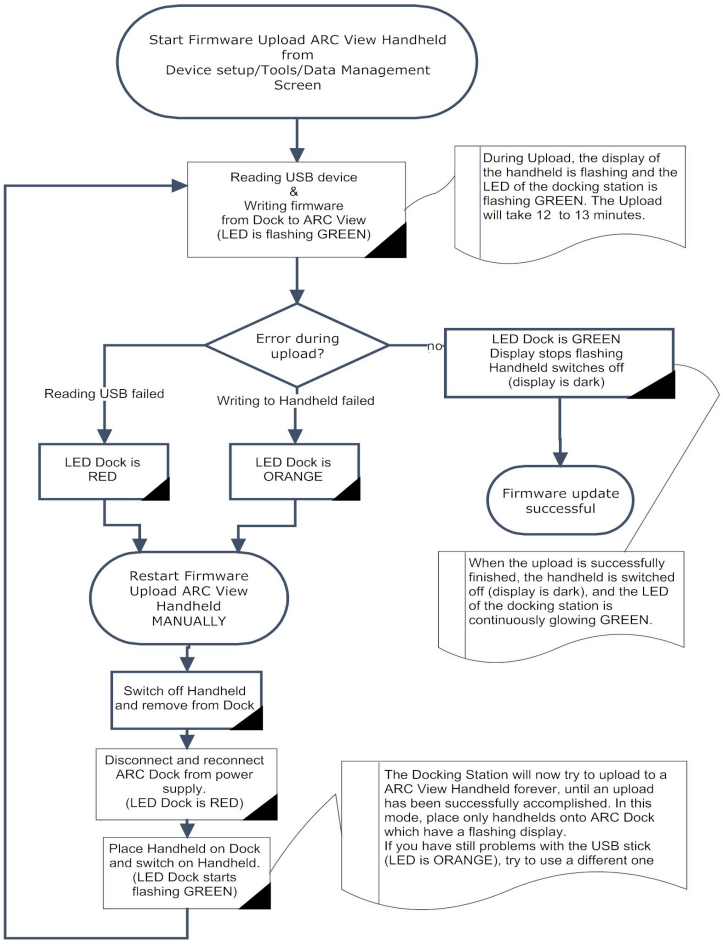


Figure D.1 Handheld firmware update

Appendix B.3 Handheld RF Module firmware update

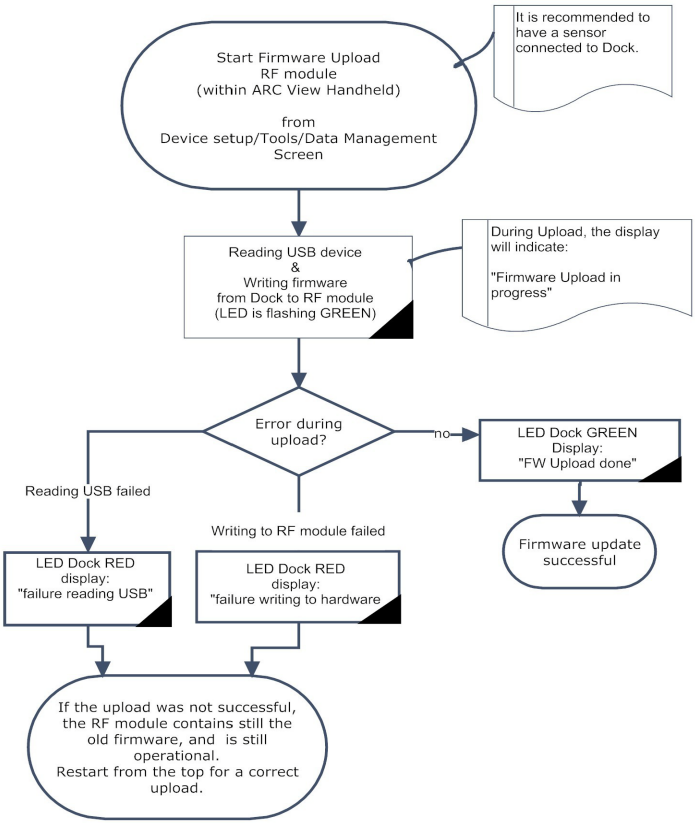


Figure D.2 Handheld RF Module firmware update

Appendix B.4 Dock firmware update

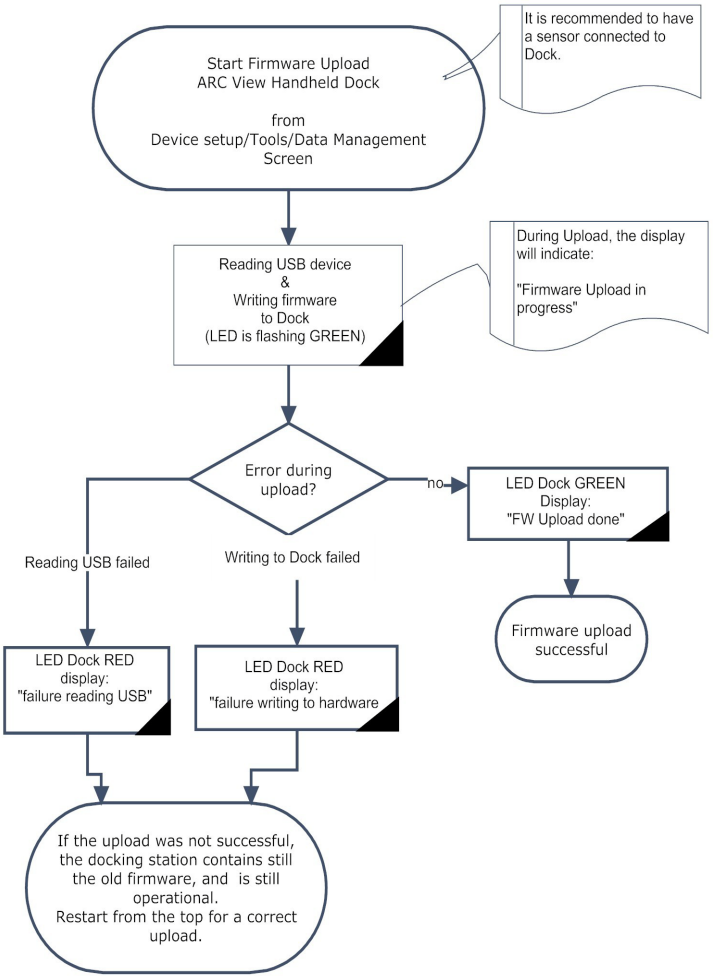


Figure D.3 Dock firmware update

Appendix B.5 ARC sensor firmware update

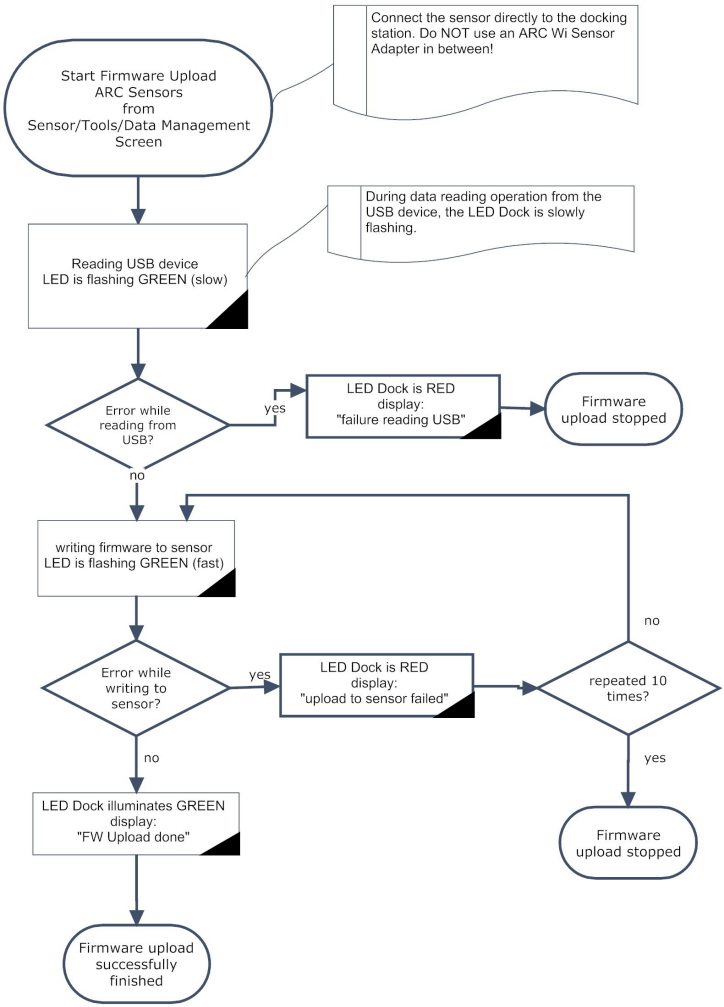


Figure D.4 ARC sensor firmware update

Appendix B.6 Wi Sensor Adapter firmware update

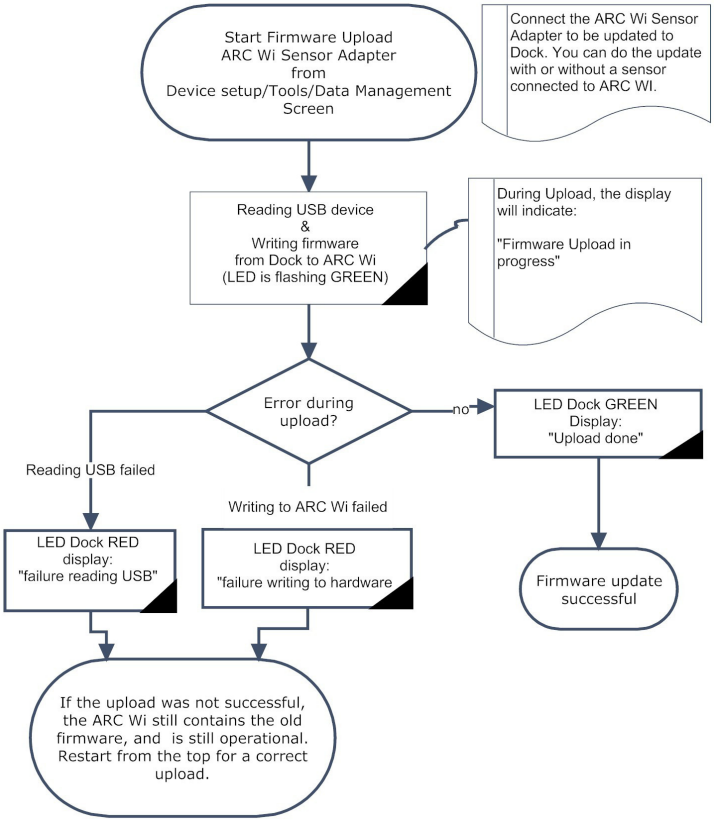


Figure D.5 Wi Sensor Adapter firmware update

Appendix C Sensor STAtus profile

This section offers details of the sensor information in the Sensor STAtus profile.

Appendix C.1 Introduction

The sensor STAtus profile (STA) is a listing of data from a selected sensor. It provides three kinds of information:

- Permanent information (serial number, product information, firmware version).
- Temporary information (interface configuration, measurement settings).
- 'Snapshot' information of the status of the sensor at the time the profile was created (error, warning).

You create an STA profile file in:

Screen 48 on Page 122: `[Sensor]` → `Tools` → `Sensor info`

You copy (download) the STA file to a memory stick in:

Screen 8 on Page 68: `ARC View Handheld` → `Tools` → `Data management`

You can view or print the STA file from any application that can display ASCII text (for example using MS Excel, Notepad or Word).

For more information, see Task 4, *Managing sensor STAtus profiles*, on Page 51.

Appendix C.2 Sensor STAtus profile details

The following example is for the Visiferm DO ARC sensor. Other sensors are similar.

Entry		Definition
*** Sensor status profile ***		
Filename: STA00001		The name of the Sensor STAtus Profile (STA) file. The number increments each time a new file is created.
ARC View Handheld		Header for section showing information about the ARC View Handheld.
Part number:	242128	Part number of the Handheld.
Serial number:	0000062	Serial number of the Handheld.

Table E.1 Printout of sensor STAtus profile

Entry		Definition
RF address:	59568162	Radio frequency address of the Handheld. This is fixed for the Handheld, and is hardware dependent.
Firmware version:	V022 16.04.2010	The version of the firmware loaded on the printed circuit board in the ARC View Handheld.
Date Time:	29.03.10 / 14:35	Date and time the sensor STAtus profile (STA) file was created. Date format is: DD.MM.YY. Time format is: HH:MM, 24-hour clock.
Operator Level		
Active operator level:	S U, A, S, D	Operator level currently active in the sensor. For more information, see Section 1.5.2, *ARC sensors: operator levels*, on Page 19.
Sensor info		Header for section showing information about the sensor detailed in the sensor STAtus profile (STA) file.
Product name:	VISIFERM DO ARC	Product name of the sensor. This field defines the type of the sensor.
Part number:	242163/01	Part number of the sensor.
Workorder number:	1383466	Number of the workorder under which the sensor was made. This serves as a further way of identifying the sensor.
Workorder date:	2009-12-02	Date of the workorder under which the sensor was made. Shown in format YYYY-MM-DD.
Serial number:	2029	Serial number of the sensor.

Table E.1 Printout of sensor STAtus profile

Entry		Definition
Firmware version user end:	ODOUM039	Version of the firmware currently loaded in the user end of the sensor. (“User end” refers to the communication electronics in the sensor.) For information about updating sensor software, see Appendix B.5, *ARC sensor firmware update*, on Page 143.
Firmware date user end:	2010-04-16	The date the firmware in the user end was created. (“User end” refers to the communication electronics in the sensor.)
Part number user end:	242998/04	Part number of the electronics in the user end. (“User end” refers to the communication electronics in the sensor.)
Serial number user end:	1207	Serial number of the electronics in the user end. (“User end” refers to the communication electronics in the sensor.)
Firmware version front end:	not applicable	Version of the firmware currently loaded in the front end. (“Front end” refers to the measurement electronics in the sensor.) **NOTE:** VISIFERM DO ARC sensors do not have a separate user end and front end. Instead, they have a single integrated unit. For this reason, “not applicable” is shown in this example. (However, this value is available for pH and conductivity sensors.)

Table E.1 Printout of sensor STAtus profile

Entry		Definition
Firmware date front end:	not applicable	The date the firmware in the user end was created. (“Front end” refers to the measurement electronics in the sensor.) Date format is: YYYY-MM-DD **NOTE:** VISIFERM DO ARC sensors do not have a separate user end and front end. Instead, they have a single integrated unit. For this reason, “not applicable” is shown in this example. (However, this value is available for pH and conductivity sensors.)
Part number front end:	not available	Part number of the electronics in the user end. (“Front end” refers to the measurement electronics in the sensor.) **NOTE:** VISIFERM DO ARC sensors do not have a separate user end and front end. Instead, they have a single integrated unit. For this reason, “not available” is shown in this example. (However, this value is available for pH and conductivity sensors.)
Serial number front end:	not available	Serial number of the electronics in the front end. (“Front end” refers to the measurement electronics in the sensor.) **NOTE:** VISIFERM DO ARC sensors do not have a separate user end and front end. Instead, they have a single integrated unit. For this reason, “not available” is shown in this example. (However, this value is available for pH and conductivity sensors.)
Sensor ID:	242163-2029	A string uniquely identifying a sensor. The sensor's part number followed by its serial number.

Table E.1 Printout of sensor STAtus profile

Entry			Definition
Measuring Point:	242163-2029		This string is freely definable by the user, but has a factory default that is the same as the Sensor ID. Often, users enter a string identifying the location at which the sensor is inserted in the process.
Measurement			Section header for named measurements displayed by the sensor. These are derived dynamically from the sensor, and represent a 'snapshot' of the current sensor readings. **NOTE:** The named measurements in this section are derived from the underlying measurement parameters shown in the section below.
DO:	96.50	%-sat	The primary measurement parameter of the sensor, the value last measured for the primary measurement parameter, and the unit currently set for the primary measurement parameter.
T:	28.11	°C	The secondary measurement parameter of the sensor, always temperature. The value shown is the value measured at the time the sensor STAtus profile (STA) file was created.

Table E.1 Printout of sensor STAtus profile

Entry			Definition
Measurement Parameter			Header for section showing details of the sensor's underlying measurement parameters, from which the named measurements displayed by the sensor are derived. (Named measurements are shown in the sections above.)
Salinity:	0.00	mS/cm	**NOTE:** This entry is found only for DO sensors. The salinity set for the sensor at the time the sensor STAtus profile (STA) file was created. **NOTE:** The unit delivered by the sensor is always the conductivity unit, mS/am.
Air pressure:	1013.00	mbar	**NOTE:** This entry is found only for DO sensors. **NOTE:** The air pressure set for the environment of the sensor at the time the sensor STAtus profile (STA) file was created. (In other words, this is not necessarily the process pressure.)The unit delivered by the sensor is always the millibar.
Moving average:	(auto) 30	none	Moving average set for the sensor at the time the sensor STAtus profile (STA) file was created. For information about moving averages, see Section 1.5.8, *ARC sensor measurements: moving average*, on Page 32. "none" indicates that there are no units.

Table E.1 Printout of sensor STAtus profile

Entry			Definition
Resolution:	(auto) 16	none	Resolution set for the sensor at the time the sensor STAtus profile (STA) file was created. For information about resolution, see Section 1.5.9, *ARC sensor measurements: resolution*, on Page 32. "none" indicates that there are no units.
Operating hours/counters			Header for section showing details of: • Operating hours at different temperatures. • Sensor event counters. • Operational limits.
Operating hours:	78.02	h	Total number of sensor operating hours recorded by the sensor during its entire life. This value acts as a time stamp to mark the time at which the sensor STAtus profile (STA) file is created.
Operating hours > 85 °C:	0.00	h	Total number of hours the sensor has operated above 85°C during its entire life.
Operating hours > 135 °C:	0.00	h	Total number of hours the sensor has operated above 135°C during its entire life.
Number of SIP:	0		Total number of Sterilizations In Place that the sensor has undergone during its entire life. **NOTE:** For more information about SIPs, see Section 1.5.7, *ARC sensors: Cleanings and Sterilizations In Place*, on Page 31.

Table E.1 Printout of sensor STAtus profile

Entry			Definition
Number of CIP:	0		Total number of Cleanings In Place that the sensor has undergone during its entire life. **NOTE:** For more information about CIPs, see Section 1.5.7, *ARC sensors: Cleanings and Sterilizations In Place*, on Page 31.
Total power-ups:	10		Total number of times the sensor was switched on during its entire life.
Temperature ranges			Header for section showing key temperatures in life history of sensor.
Operating temperature min.:	-40.00	°C	Lowest temperature at which the sensor can operate. **NOTE:** This value is not displayed on the Handheld.
Operating temperature max.:	135.00	°C	Highest temperature at which the sensor can operate. **NOTE:** This value is not displayed on the Handheld.
Measurement temperature min.:	-20.00	°C	Lowest temperature at which the sensor can give a reliable measurement. This value depends on the sensor type. **NOTE:** This value is not displayed on the Handheld.
Measurement temperature max.:	85.00	°C	Highest temperature at which the sensor can give a reliable measurement. This value depends on the sensor type. **NOTE:** This value is not displayed on the Handheld.

Table E.1 Printout of sensor STAtus profile

Entry			Definition
Calibration temperature min.:	0.00	°C	Lowest temperature at which the sensor can be calibrated. This value depends on the sensor type. **NOTE:** This value is not displayed on the Handheld.
Calibration temperature max.:	60.00	°C	Highest temperature at which the sensor can be calibrated. This value depends on the sensor type. **NOTE:** This value is not displayed on the Handheld.
Warnings			Header for section showing any warnings in force at the time this sensor STAtus profile (STA) file was created.
none			For information, see Section 4.4, *Troubleshooting warning and status messages*, on Page 127.
Errors			Header for section showing any errors in force at the time this sensor STAtus profile (STA) file was created.
none			For information see Section 4.5, *Troubleshooting error messages*, on Page 130.

Table E.1 Printout of sensor STAtus profile

Entry		Definition
Quality		Header for section showing quality of sensor reading at the time this sensor STAtus profile (STA) file was created.
Quality indicator:	97% excellent	An indicator of the quality of the sensor reading. This is expressed on the handheld as: excellent, good, acceptable, poor, very poor, defective. However, in this sensor STAtus profile (STA) file, the percentage value of the quality indicator is also shown. For information, see: • Section 1.5.11, on Page 34. • Screen 20 on Page 80.
SIP/CIP Definition		Header for section showing the upper and lower temperature limits for Sterilizations In Place (SIPs) and Cleanings in Place (CIPs). These limits define the conditions used by the sensor to recognize a SIP or a CIP. **NOTE:** The temperature unit is always °C. For more information, see Section 1.5.7, on Page 31.
SIP min. temperature:	120 lower limit of temp. range / °C	Minimum temperature at which a Sterilization In Place is recognized by the sensor. SIPs below this temperature are not counted.
SIP max. temperature:	135 upper limit of temp. range / °C	Maximum temperature at which a Sterilization In Place is recognized by the sensor. SIPs above this temperature are not counted.

Table E.1 Printout of sensor STAtus profile

Entry			Definition
SIP min. time span:	20	min. time in temp. range / min	Minimum time period over which a Sterilization In Place event is recognized by the sensor. SIPs that take place over a shorter period are not counted.
CIP min. temperature:	80	lower limit of temp. range / °C	Minimum temperature at which a Cleaning In Place is recognized by the sensor. CIPs below this temperature are not counted.
CIP max. temperature:	100	upper limit of temp. range / °C	Maximum temperature at which a Cleaning In Place is recognized by the sensor. CIPs above this temperature are not counted.
CIP min. time span:	20	min. time in temp. range / min	Minimum time period over which a Cleaning In Place event is recognized by the sensor. CIPs that take place over a shorter period are not counted.
Configuration digital interface			Header for section showing configuration details of the sensor's digital interface. For information, see *Digital RS485 Modbus RTU interface*, on Page 1-18.
Modbus address	1	Modbus address	
Baud rate:	19200	bit/sec	Baud rate of the digital RS485 interface on the sensor that was selected at the time this sensor STAtus profile (STA) file was created. For information, see Section 1.5.5.3, *Baud rates*.
Parity:	none	none,even,odd	Parity status of the digital RS485 interface on the sensor that was selected at the time this sensor STAtus profile (STA) file was created.

Table E.1 Printout of sensor STAtus profile

Entry			Definition
Stop bits:	2	1,2	Number of stop bits set for the digital RS485 interface on the sensor that was selected at the time this sensor STAtus profile (STA) file was created. (This value is required for programming the PLC.) Operators cannot change this status.
Configuration analog interface Section showing the configuration of the analog interface that was selected on the sensor at the time this sensor STAtus profile (STA) file was created.			
Analog interface 1:		mA/ECS-Interface	Name of analog interface that was selected on the sensor at the time this file was created. This can be *Analog interface 1* or *Analog interface 2*. For information, see *Analog interfaces*, on Page 1-17.
Output mode:		4–20 mA linear	Output mode in force on the analog interface of the sensor at the time this file was created. For information, see Table 1.6, *Explanation of interface modes configured on* `[Sensor] à Tools à Interface configuration à mA interface #1 [or #2, or mA/ECS-Interface] à Interface mode`, on Page 28.
4–20 mA output			Header for section showing the configuration of the analog interface that was selected on the sensor at the time this file was created.

Table E.1 Printout of sensor STAtus profile

Entry			Definition
4–20 mA measurement channel:	DO		The named measurement configured for Analog Interface 1 at the time this sensor STAtus profile (STA) file was created. There are three possibilities: • Cond = Conductivity • pH = pH • DO = Dissolved oxygen
Measurement value at 4 mA:	0	%-sat	Measurement values configured to correspond to outputs of 4 mA, 12 mA, and 20 mA from the analog interface selected at the time this file was created. In this file, an output of 4 mA indicates a value of 0%-sat, 12 mA indicates 150%-sat, and 20mA indicates 300%-sat. For more information, see Section 1.5.6.3, *Configuring the mode of the analog interfaces*, on Page 27.
Measurement value at 12 mA:	150	%-sat	
Measurement value at 20 mA:	300	%-sat	
Unit of measurement:	%-sat		Unit of measurement configured for the sensor at the time this file was created.
Fixed test value:	10	mA	Value configured for the analog interface test signal at the time this file was created.
Mode in event of warning:	No output		Modes configured for the analog interface signal in event of warnings and errors, at the time this file was created.
Mode in event of error:	Continuous		
Output in event of warning:	3.5	mA	Output currents configured for the analog interface signal in event of warnings and errors, at the time this file was created.
Output in event of error:	3.5	mA	
Output for T out of limit:	3.5	mA	Output current configured for the analog interface signal to indicate that temperature is above its accepted range.

Table E.1 Printout of sensor STAtus profile

Entry			Definition
Active output signal:	12.2	mA	Current being output by the analog interface at the time this file was created.
ECS Output			**NOTE:** This section is for VISIFERM DO sensors only (Not available for VISIFERM DO ARC). Header for section showing details of electro-chemical sensor simulation output from the analog interface.
Current in zero oxygen(+25°C):	0	nA	Output current configured to be delivered by the analog interface when in ECS simulation mode, when in zero oxygen, at the time this file was created. **NOTE:** The unit is always nA.
Current in air(+25°C):	60	nA	Output current configured to be delivered by the analog interface when in ECS simulation mode, when in air, at the time this file was created. **NOTE:** The unit is always nA.
Temperatur coefficient:	3.1	%/K	
Fixed test value:	100	nA	Value configured for the analog interface test signal, when in ECS simulation mode, at the time this file was created. **NOTE:** The unit is always nA.
Mode in event of warning:	No output		Modes configured for the analog interface signal, when the interface is in ECS mode, in event of warnings and errors, at the time this file was created.
Mode in event of error:	Continuous		

Table E.1 Printout of sensor STAtus profile

Entry			Definition
Output in event of warning:	522	nA	Output currents configured for the analog interface signal, when the interface is in ECS simulation mode, in event of warnings and errors, at the time this file was created.
Output in event of error:	544	nA	
Output for T out of limit:	566	nA	Output current configured for the analog interface signal, when in ECS simulation mode, to indicate that temperature is above its accepted range.
Active output signal:	0	nA	Current being output by the analog interface, if in ECS mode, at the time this file was created.
Calibration			Header for section showing details of last sensor calibration.
Phase in zero oxygen (+25°C):	70.68	°	For dissolved oxygen sensors, the underlying primary parameter is the phase difference between the excitation source and fluorescent signals, as shown in the example here. The DO reading is derived from this phase difference.
Stern-Volmer coefficient (+25°C):	0.0241	none	Value of the Stern-Vomer coefficient at the last calibration of the sensor. **NOTE:** "none" indicates that there are no units.
Calibration Temperature:	25	°C	The temperature at which the last calibration of the sensor took place.
Calibration data: point 1			Header for section showing values and units measured for the primary parameter at the Calibration data: point 1 stage of the sensor's last calibration.

Table E.1 Printout of sensor STAtus profile

Entry			Definition
Sensor reading:	70.68	°	Raw measurement value at CP1. For dissolved oxygen sensors this is the phase difference between the exit at ion source and fluorescent signals, as shown in the example here.
Concentration:	0.00	mbar	Primary sensor measurement value and parameter name. For dissolve oxygen sensors the unit is always millibar.
Temperature:	25	°C	
Air pressure:	1013	mbar	Air pressure set for the environment of the sensor at the sensor's last calibration.
Salinity:	0.0000	mS/cm	Salinity level set for the sensor at the sensor's last calibration.
Operating hours:	0	h	
Calibration data: point 2			Header for section showing values and units measured for the primary parameter at the Calibration data: point 2 of the sensor's last calibration.
Sensor reading:	37.03	°	The definitions of these entries is the same as for the entries under *Calibration data: point 1* above.
Concentration:	7434.04	ug/l ppb	
Temperature:	30	°C	
Air pressure:	1013	mbar	
Salinity:	0.0000	mS/cm	
Operating hours:	31	h	

Table E.1 Printout of sensor STAtus profile

Index

Numerics

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

Q

R

S

T

U

V

W

Z

Additional information

For additional information about the ARC sensors and their features (for example, sensor performance, sensor diagnostics, and connection options) refer to the ARC product brochure and sensor certificates.

Up to date drivers, software, support information and information about other HAMILTON products can be found at our website: www.hamiltoncompany.com

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