# Consistent Look & Feel

# - EDDL makes Intelligent Device Management software humane

When devices from multiple vendors were first integrated using bus technologies there were difficulties accessing all device features and there were difficulties to make full use of the features that could be accessed. Many plants were not able to use the device management software part of their asset management solutions to its full potential. A new concept was required to achieve even greater results with digital bus technologies. The new innovative solution to the problem was enhancements to an old technology that has been an unnoticed part of leading digital bus technologies for over fifteen years. This international standard, called EDDL (IEC 61804-3), with enhancements, makes bus technologies come alive and easy to use in exactly the same way the World Wide Web made the old Internet come alive and so easy that anyone could use it. Systems based on EDDL with enhancements now make maintaining intelligent devices very much easier for technicians and enable digital bus technologies to be fully utilized to derive greater result for the plant and there are no other means to achieve the same result. This article will explain how consistent look & feel is achieved in spite of each device manufacturer independently deciding display content any way they like.

## Challenge

Plants often use a mix of FOUNDATION fieldbus, PROFIBUS, HART, and WirelessHART. Using different software for each protocol would be impractical and difficult to learn.

Plants use devices from different vendors, as part of the main system and package units. Using different tools for each vendor would be impractical and difficult. Plants have many different kinds of devices such as a variety of transmitters and analyzers, drives, positioners and actuators, etc. Using different software for each model would also be impractical. Therefore the plant needs one single tool to manage all devices regardless of type, protocol or manufacturer.

### *Software and Drivers*

In the past, sophisticated (complex) devices such as radar level transmitters and variable speed drives each had stand-alone software for setup and diagnostics. This was difficult to use because each application had a different look & feel, that is, screen appearance and navigation was different for each device. Another solution used driver programs for each device type and executed them under a common title bar but did not solve the ease of use problem because driver programs are still fundamentally different software, by different programmers, with different ideas, with an individual look & feel. Many years of style guides did not alleviate these problems, partly because conformance too a style guide cannot be automatically tested but must be subjectively judged by a human, for every page, tab, frame, and individual element. Only the few aspects covered in the style guide stands a chance, anything additional will not. Even though the software or driver for each device type is user friendly as most claim to be, the great number of different software and drivers for the many device types the technician has to learn becomes a burden. A new solution was needed.

### *Software Inconsistencies*

Stand-alone software and driver programs will inevitably see inconsistencies. This problem is prevalent in any computer where software from many different suppliers is used. Device management software not based on EDDL is an extreme case because plants have so many different kinds of devices and it therefore involves many more suppliers than is common for computers in general. It is worse than business applications before Office-suites.

### *Nuisance*

If the technician is forced to stop to think and pay attention to the software, this momentary difficulty can derail the technician's train of thought. It interferes with the task. Unfortunately, flexible and innovative user interfaces have the drawback that technicians cannot apply what they learn for one device type to other device types throughout the rest of the system. For instance, in another device the buttons are not where the technician expected. The technician is more likely to make errors.

### *Element of Danger*

During normal plant conditions, inconsistencies in operation between different devices are merely a frustrating nuisance that reduces productivity. However, during abnormal plant conditions these same inconsistencies between devices can actually be dangerous. The device management software may fall into disuse. During critical situations the technicians must be able to act quickly, often under pressure. But when different devices are not operated the same way the technicians will not have learnt to perform the right keystrokes automatically and will lose precious time searching for functions and may even make mistakes.

Therefore it is important that device management software and tools work consistently for all devices making use intuitive and reducing mistakes, particularly under stress.

## EDDL Solution

The HART protocol in conjunction with EDDL (formerly "DDL") replaced multiple handhelds with a single handheld or laptop as early as 1992 while at the same time ensuring consistent look & feel, but at that time did not provide any graphics. Intermediate solutions provided great graphics but at the expense of consistent look & feel.

A new concept was required where device developer is at complete liberty to include all the functionality required to access all features in the device, yet excessive individualism must be prevented technically to avoid inconsistent look & feel. The solution was inspired by the HTML technology used to render rich graphics for any kind of web page in any kind of web browser. Therefore a new visual technology evolved to a new level from the traditional DDL technology: EDDL with enhancements with graphics for ease of use in device management by displaying consistently, interacting consistently, and printing consistently.

Thanks to the display consistency ensured by EDDL, technicians will quickly learn the right keystrokes and can focus on *what* to do, need not have to figure *how* to do it. A secondary benefit of consistency is that when software is easy to use it becomes more popular among the technicians that are supposed to use it. It will be incorporated as a natural part of the day-to-day work processes.

### *Look & Feel vs. Content & Structure*

EDDL recognizes the subtle, but important, difference between look & feel one the one hand, and content & structure on the other. Using EDDL the device manufacturer determines content and structure of the display for the device (e.g. if there is a button or not, and where in the menu the button is located). The software tool does not determine the content or structure. For EDDL the software tool determines the look & feel (e.g. the size and color of the buttons). This distinction is key to the consistency in look & feel.

**Content & Structure**—The information and how it is organized. That is, what information is displayed and where, and what functions are provided.

**Look & Feel**—Appearance of and interaction with controls such as buttons and parameters. Look includes for instance background and foreground color, size, shape, font, and icons etc. and how these change depending on status. Feel includes single-click, double-click, selection, typing, or

expanding from a list etc. This is particularly so for functions shared by all devices.

## Consistent Look & Feel

The old adage goes: Repetition is the mother of learning. When all devices are operated the same way, the technicians will not forget how to do their job. EDDL makes sure that devices are displayed consistently regardless of the protocol being HART, FOUNDATION fieldbus, PROFIBUS, or WirelessHART, and regardless of manufacturer, and regardless of it being a radar level transmitter, valve positioner, variable speed drive, or pump health monitor etc.. In the classic ease-of-use book "*The Humane Interface*" this feature has the rather unflattering name of "monotony of design" but is extremely important to user performance.

### *A Humane Interface Solution*

When using software there is first a learning phase when we seek to master it. If we use it repeatedly, use becomes automatic without thought or conscious effort. It's like riding a bicycle. The key to interoperability is to create a user interface that allows the technician to quickly develop automatic behavior, to use the system without having to stop and think and pay attention to it. This makes it easier to learn and use, increases productivity, and is more fun. When the system is consistent, learning while working on one device makes the technician automatic on all, or at least greatly reduces the time it takes to learn the rest. Thanks to repetition, usage becomes second nature. The technicians will have the clicks and key strokes at their finger tips. It is important to make the user interface consistent so that technicians learn it and it becomes automatic. To make a user interface that can be operated automatically by a human, constraints have to be put on the creativity in order for automatic habits to form. The user interface must in fact be monotonous such that sequences of actions combine into gestures, which, once started proceed automatically. The technician cannot routinely pay attention to which kind of device and the task at the same time. Therefore all devices should work the same way, for instance to apply an edited value, how to print, how to get help, and how to pan/zoom on the graphs and charts etc.

EDDL is a concept that reduces inconsistencies between different device types by using the same common user interface elements across all devices and eliminating unnecessary creativity such as overly artistic display. This way, sequences of clicks can readily be learned by newcomers and they soon become automatic. Many button and menus are applicable to any device with the same result.

### *Device Management Software*

For an application that does not use EDDL, every device is displayed with different buttons in different places to access device specific help, to print, and to apply parameter changes. Devices are displayed with different background color and sometimes image, but no meaning should be read into this. The font, color, and size for text differ. And there may be many other unique peculiarities as well.

An important characteristics of EDDL is that it separates device-specific functionality from standard functionality. Functions like help, print, and sending changes to the device are common to all devices. Buttons for these functions are therefore part of the EDDL-based software's common environment. In addition to consistency for devices, it also means consistency with other applications in the control system and asset management solution the device management software is part of.


**Figure 1 standard functions like print, apply or cancel changes, and access manual are activated from the same button every time**

### Print

In device management software based on EDDL, printing the configuration is done using the same button for every device. That is, the print button is always in the same place.

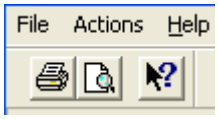


**Figure 2 standard functions like print and help are activated from the same button every time**

### Context Sensitive Help

For an application that does not use EDDL, every device is displayed with different buttons in different places to access device specific help.

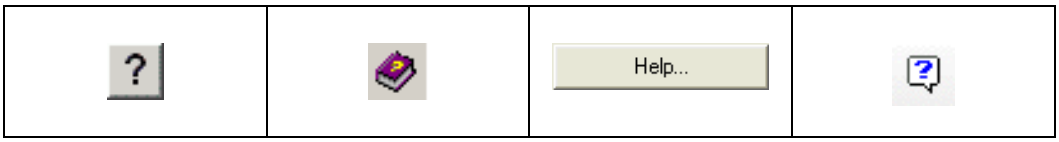


**Figure 3 inconsistent appearance of button to get help for devices in an application not based on EDDL**

Another ease of use aspect discussed in *The Humane Interface* is the universal use of text. Because a picture says a thousand words, the exact meaning of an icon may sometimes not be clear. Therefore EDDL with enhancements provides a label for everything on the screen and help text, in Window displayed as tooltip text. To find help for a button on the screen, click on help and then the parameter status indicator or button in question and the help for it appears. The technician need not have to search a large chunk of text.

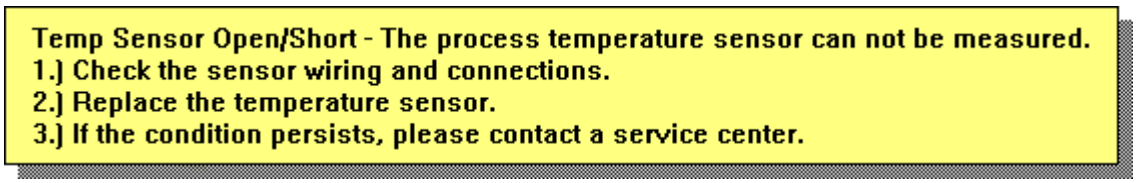


**Figure 4 Help text appears as tooltip in Windows**

Displaying the context sensitive help text provided by the device manufacturer is a feature common to all devices and therefore done from the system, using the same button for every device. For an application that uses EDDL, every device is displayed with identical buttons for help, always in the same place. Yet the tooltip text itself comes from the device manufacturer.

| Metso<br>Fieldbus<br>Valve Positioner | Endress+Hauser<br>Fieldbus<br>Pressure | Samson<br>HART<br>Valve Positioner | Siemens<br>HART<br>Temperature | Fisher<br>Fieldbus<br>Valve Positioner |
|---|---|---|---|---|
|  |  |  |  |  |

**Figure 5 consistent appearance of button to get help for devices with different protocols, manufacturer, and type**

### Applying Changes

In software built on technologies other than EDDL, every device is displayed with different buttons to apply a parameter change. That is, to send it to the device. It is hard to remember how to apply a change for each type of devices.


**Figure 6 inconsistent appearance of button to apply a change in an application not based on EDDL**

However, with the EDDL solution, changes are applied or cancelled using the same buttons for all devices. There is no question of where to click.

| Metso<br>Fieldbus<br>Valve Positioner | Endress+Hauser<br>Fieldbus<br>Pressure | Samson<br>HART<br>Valve Positioner | Siemens<br>HART<br>Temperature | Fisher<br>Fieldbus<br>Valve Positioner |
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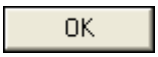
|  |  |  |  |  |

**Figure 7 appearance of button to apply a change for devices with different protocols, manufacturer, and type**

### *Device Display*

For software and tools not based on EDDL, the display properties vary greatly from one device display to the next. For some device brands there is a header with basic information, for others not, and some can turn header on or off. For some device displays the parameters are grouped in tabbed cards, others not. Some device manufacturers use a parameter navigation tree, others don't. The navigation tree may be either vertical on the left or horizontal on top, and some can turn the navigation tree on or off. Each manufacturer use different icons. Some device brands have a status bar at the bottom, others on top, and some none at all. Without EDDL, so-called single software solutions appear as, and indeed are, multiple programs.

EDDL gives the device developer freedom of providing content, yet common display properties such as header, tabbed cards, navigation tree, and status are provided by the system, and thus done the same way for all devices. For instance, the device developer defines how many branches there shall be on the navigation tree, and how many tabbed cards, but does not define how they actually look. Therefore all navigation trees and tabbed cares are rendered the same way with the same icons for any device and this makes software based on EDDL much easier to learn, and much harder to forget.

#### Device Root Menu

Without EDDL, device management software display every device with a different root menu. This makes it harder to know where to start navigation.

EDDL has a root menu used for all devices. This serves as a familiar starting point for the technician to find information about the device under the categories of Configure/Setup, Device Diagnostics, and Process Variables and get started on the task at hand. This menu can be automatically checked and enforced as part of interoperability testing because the Interoperability Test Kit reads the EDDL file.

| Metso<br>Fieldbus<br>Valve Positioner | Endress+Hauser<br>HART<br>Pressure | Samson<br>HART<br>Valve Positioner | Siemens<br>HART<br>Temperature | Rosemount<br>HART<br>Radar Level |
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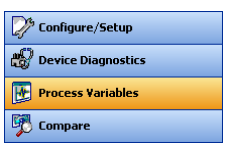
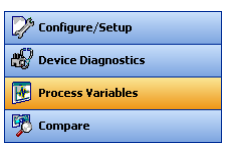
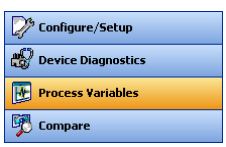
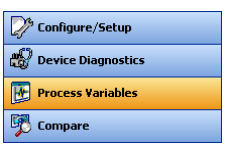
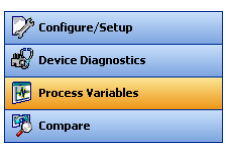
|  |  |  |  |  |

**Figure 8 The root menu is part of the interoperability technical report**

### Trend Chart

In a system with devices from ten suppliers, in an application that does not use EDDL, there could be ten styles of trend charts for the technician to figure out: different grid lines, axis scales, and pen source identification. The toolboxes are not the same so pan and zoom are done differently.

EDDL with enhancements ensures strip charts for every device regardless of protocol, manufacturer, or model is rendered the same way and work the same way. Pens, axis, and grid use a consistent style regardless of what it trends.

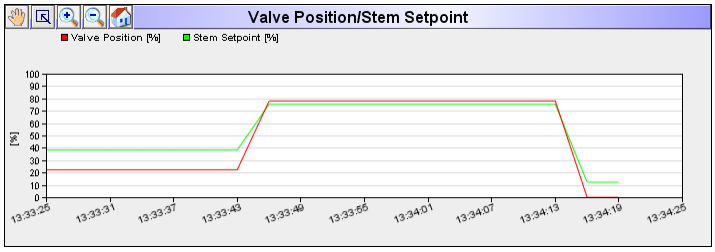



**Figure 9 Charts are consistent for every device**

### Waveform Graph

If the device management software is not built on EDDL, every device is displayed with a different style of waveform graph: grid lines, axis scales, and waveform identification. Pan and zoom are done differently because the toolboxes are not the same.

EDDL with enhancements renders graphs for every device regardless of protocol, manufacturer, or model are rendered the same way and therefore work the same way. The curves, axis, and grid use a consistent style regardless of what it plots.

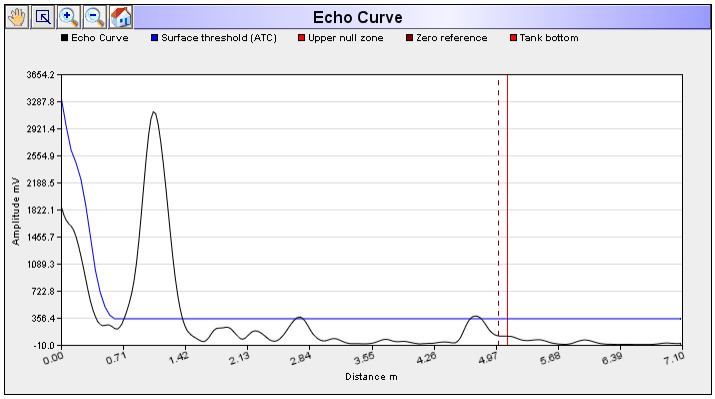



**Figure 10 The same graph style is used for every device**

### Chart & Graph Toolbox

In a system with devices from ten suppliers, in an application that does not use EDDL, there could be ten different ways to pan and zoom in trend charts and waveform graphs.

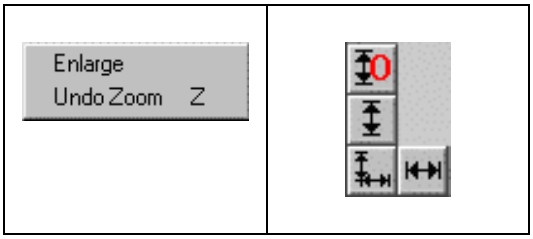



**Figure 11 inconsistent appearance of chart and graph tools in an application not based on EDDL**

Another example of how EDDL with enhancements provides consistent look & feel is that the toolbox for all charts and graphs which for all devices look the same and work the same way. That

is, the way to pan and zoom is the same for every device throughout the entire system. This makes the tools easier to use, so that they will be used.

| Metso<br>Fieldbus<br>Valve Positioner | Endress+Hauser<br>Fieldbus<br>Pressure | Samson<br>HART<br>Valve Positioner | Siemens<br>HART<br>Temperature | Fisher<br>Fieldbus<br>Valve Positioner |
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**Figure 12 graph and chart tools pan and zoom the same way for any device in the entire system**

### Gauge

In a system with devices from multiple suppliers, in an application that does not use EDDL, there could be just as many different styles of gauges: 180 or 270 degrees, variable identification, numerical value display, and scaling etc.

EDDL with enhancements gives the device developer freedom of providing content, yet enforces consistency of user interaction. For instance, the device developer defines that there should be a gauge but does not define how the gauge actually looks. Therefore all gauges are rendered the same way for any device regardless of the value it shows, and this makes software based on EDDL much faster to learn.

| Rosemount<br>HART<br>Pressure | Siemens<br>HART<br>Output Current | Rosemount<br>Wireless<br>Battery Voltage | Foxboro<br>HART<br>Actuator Pressure | Fisher<br>Fieldbus<br>Actuator Pressure |
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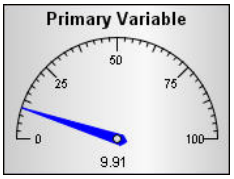
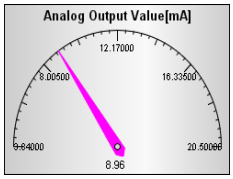
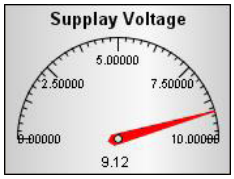
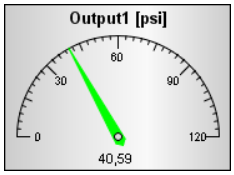
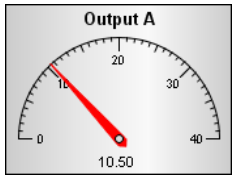
|  |  |  |  |  |

**Figure 13 appearance of gauge for devices with different protocols, manufacturer, and type**

### Bar Chart and Histograms

An application that does not use EDDL, in a system with devices from ten suppliers, there could be ten different styles of bar-graphs.

Dynamic mimics of bar-graphs is consistent so that scales, variable identification, and numerical values is the same regardless of what the bars represent, and read as expected. This is ensured using EDDL with technology. Histograms work the same way.

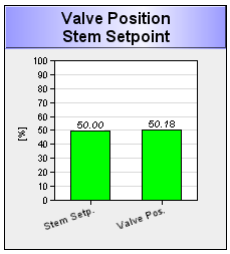



**Figure 14 Bar-graphs are identical for all devices**

### Parameter Representation

For an application that does not use EDDL, every device is displayed using different ways to indicate parameter status, for instance that the value has been changed by the technician and needs to be downloaded into the device. Some devices may color parameter background, some color the

parameter value or underline it, others use different kinds of icons to flag the value has been changed. It is very difficult for a technician to keep track of such a multitude of different indicators.

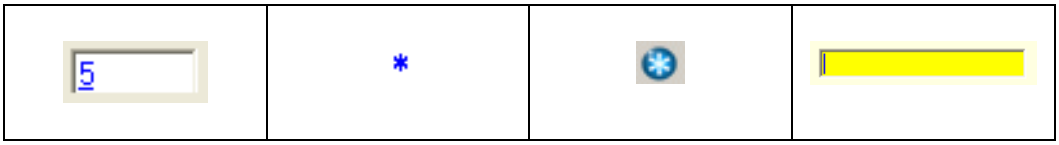



**Figure 15 inconsistent appearance of a changed parameter in an application not based on EDDL**

Consistent display of parameters is also ensured by EDDL with enhancements. If the parameter is read-only this is indicated the same way for every device regardless of protocol, manufacturer, or model - because it is flagged by the system software itself, not third-party drivers. Similarly, if the parameter value has been edited by the technician, this is indicated the same way for all devices.

| Metso<br>Fieldbus<br>Valve Positioner | Endress+Hauser<br>Fieldbus<br>Pressure | Samson<br>HART<br>Valve Positioner | Siemens<br>HART<br>Temperature | Fisher<br>Fieldbus<br>Valve Positioner |
|---|---|---|---|---|
| | | | | |

**Figure 16 consistent appearance of a changed parameter for devices with different protocols, manufacturer, and type**

Moreover, when comparing parameters in the online device against the database, any discrepancies are indicated the same way for all devices, facilitating reconciliation. If communication is lost with an online device, this is indicated the same way for all devices. Lastly, diagnostic status is flagged consistently for all devices.

#### Dialog Prompts

Inconsistent dialog prompts in systems not based on EDDL make the technicians' work harder. For instance, if a zero calibration trim for a pressure transmitter is not successful, an application that does not use EDDL may for one brand prompt "*Do you wish to try again?*" for which the technician would click 'Yes' to zero and 'No' to abort while another brand may prompt using the reverse logic "*Do you wish to abort?*" in the exact same situation for which technician would instead have chose the opposite: 'No' to zero and 'Yes' to abort. The chance of mistakes is great. Some device brands have a language selection set for each type at the device level, others don't.

EDDL has a multilingual dictionary including standard text for user prompt, error messages, parameter labels, and even help. This dictionary is used to provide consistency making work more intuitive and reducing errors. For EDDL with enhancements the message would be "*Do you wish to zero the input and try again?*" in both cases above. The text is provided in multiple languages and can also display in for instance German or Italian. Language is selected once, system-wide, not individually for each device type.

## One Way

An important aspect in achieving consistency for ease of use is drawing on only a single technology. Any time two technologies are mixed there will be two basic ways of performing functions; two ways to calibrate, two ways to setup, and two ways to diagnose. Therefore, using EDDL as the only device integration technology is the first step towards making the system easy to use.

## Incorporation

A consistent user interface is more productive, has lower training cost, and requires fewer calls to the support center. The classic user-interface book "*The Humane Interface*" calls such a philosophy

an end to stand-alone applications. EDDL with enhancements erases furrows from the brows of technicians making it easier to incorporate intelligent device management software into daily work processes. EDDL with enhancements is the only international standard for device integration, and it ensures this consistency. There are no other means to achieve the same result.

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