Analogue signals – With Fupla and Heavac library

Contents

1. Programming with HeaVAC FBoxes (HeaVAC library)

Where HeaVAC FBoxes are used, there is no need to convert digital values (DV) into the units required by the user, as the FBoxes provide the option to convert the measured value directly into the requested units.

The base unit for the output of signals is $^{1}/_{10}$%. So, for an input value of 1000 entered into a HeaVAC FBox for an output module, the maximum output value will be output from the module.

Conversely, when measuring a voltage from 0..10 volts, the value 500 will be output to indicate 5 volts.

Another great advantage of the HeaVAC library is the ability to output $^{1}/_{10}$° C for temperature measurements.

The desired unit can be entered in the “Adjust” window for the FBox. This window is opened by double-clicking on the FBox.

1.1 Initialising the HeaVAC FBox library

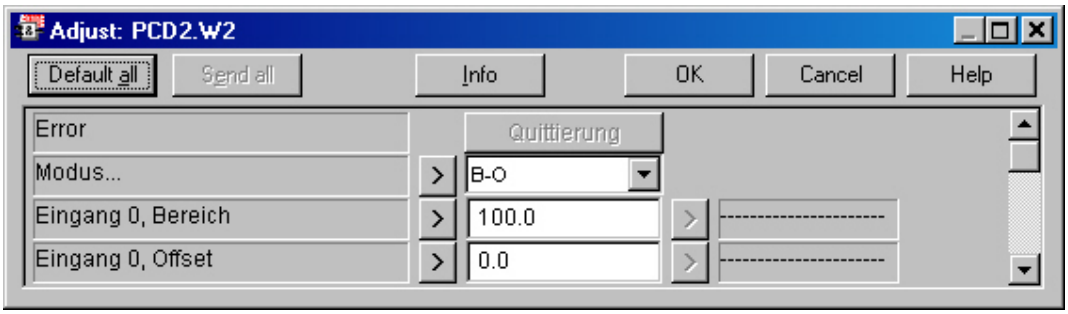
Where at least one FBox from the HeaVAC library is used in a Fupla file, a HeaVAC initialization FBox must be placed at the top of the file. Among other things, this HeaVAC-Init FBox can be used to handle the automatic changeover from summertime to wintertime, to set default values for time programs, and to reset values changed by the customer (e.g. target temperature values) to default values.

If the HeaVAC-Init FBox is omitted, the following error message will be output at Build time:

Warning 6: C:\Program Files\SAIA-Burgess\PG5\Libs\App\HEAVANLG.lib: Line 31: Caused by Heavac.
The use of any Heavac Fbox needs the Heavac-Init Fbox to be placed at the top of the file.
If there are several blocks in the same file, the Heavac-Init Fbox must be placed at the top of the first block in the list.
If there are several files using Heavac Fboxes, on Heavac-Init Fbox must be placed at the top of each file.

1.2 Parameterising the HeaVAC FBox for PCD2/3.W2xx

The PCD2.W2xx FBox (also used for PCD3.W2xx modules) reads from the input module and calculates the output value parameterised by the programmer, allowing the value output from the FBox to be reused directly in the program. This dispenses with the conversion required with the standard FBoxes.



In the “Adjust” window for the FBox, the range of the output signal and the value offset can be defined. The method (mode) to be used can also be selected. The relevant options, which are applicable to all individually scalable FBoxes, are described briefly in the next section.

1.3 Mode (option to select scaling method)

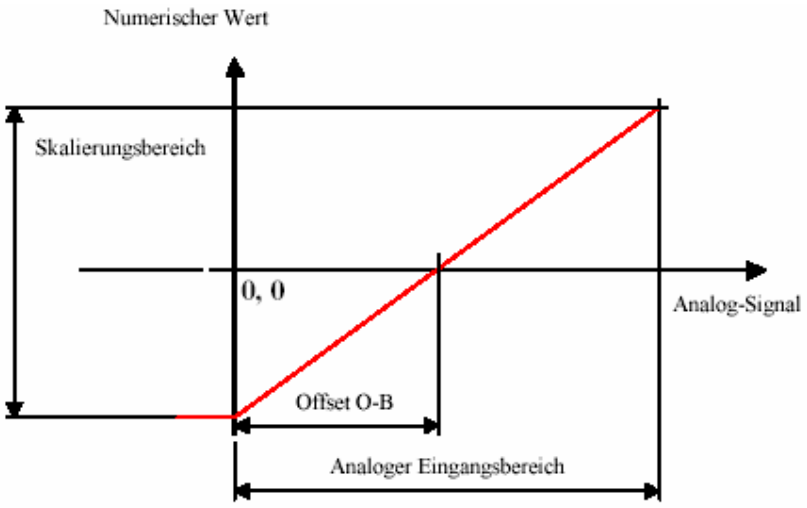
The mode for this FBox defines whether the offset should be applied to the user units or directly to the digital value from the analogue-digital converter.
Depending on the mode, the offset unit will vary:

- In O-R mode, the offset is given in [LSB] (least significant bit)
- In R-O mode, the offset is entered directly in the units to be output.

O-R mode is used very rarely, as the measured value deviation in user-defined units is known, but the measurement error in [LSB] is not.

1-1 No scaling of the value. The value is dependent on the resolution of the D/A converter on the input card. The digital value of the module is output (unit = [LSB]).

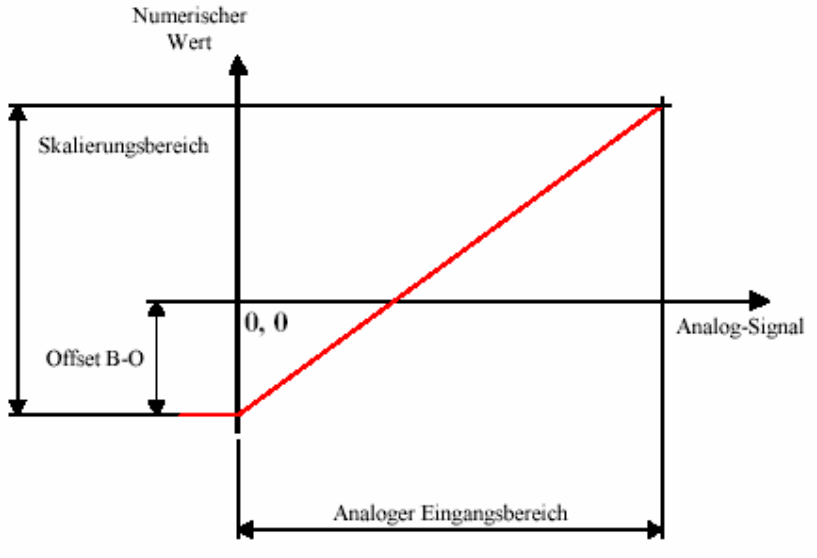
O-R The offset value is first added to the result of the measurement, then the range is converted (scaled).



Associated formula:

$$FBoxOutput = (Digitalvalue + Offset)\frac{Range}{\mathrm{Re}\,solutionof\ \mathrm{mod}\,ule}$$

R-O First the range is scaled (converted), then the offset value is added.



Associated formula:

$$FBoxOutput = \frac{Range * Digitalvalue}{resolutionof\ \mathrm{mod}ule} + Offset$$

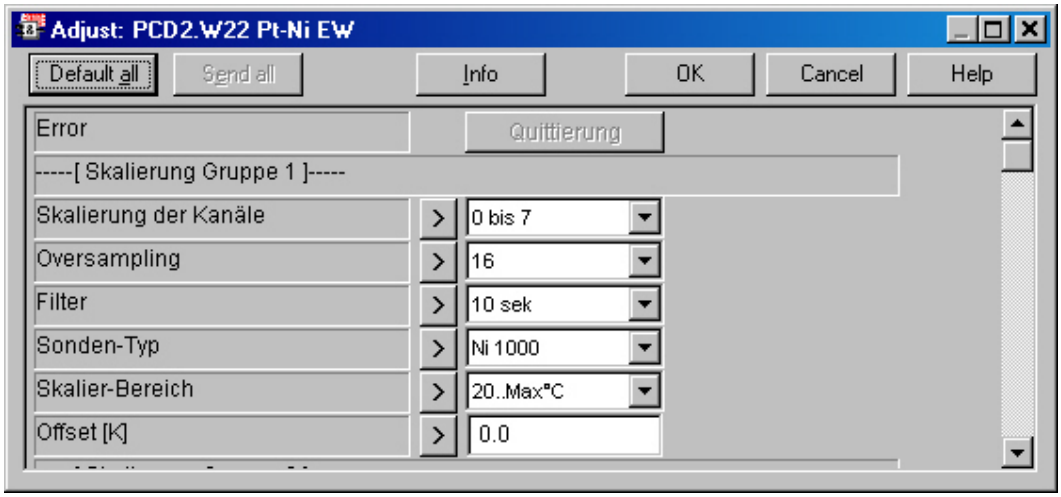
1.4 Parameterising the HeaVAC FBox for PCD2/3.W220

On page 2 of the program, there is also an FBox of type PCD2.W22+ (PCD2.W22 Pt-Ni EW). This is a special FBox for reading from temperature sensors. The FBox provides a facility to attach up to 3 different sensors, which are grouped together and must be wired in series.

This FBox is also capable of detecting a sensor failure or a short circuit on the sensors. In the event of one of these errors, the output Err (error) will be set, and a substitute value (defined in the “Adjust” window for the FBox) will be sent to the output, so the rest of the program does not have to work with extreme variations in value.

The temperature is output in $^{1}/_{10}$° C, as usual for FBoxes in the HeaVAC family.

As mentioned above, the attached sensors are split into three groups, whereby the same settings have to be used within each group.



Overview of parameters:

Error: Confirm button for error display

--[Scaling group]--

Channel scaling: Selection of calibrated channels according to the following options

Oversampling: Oversampling factor. Recommended values 8 to 16.

Filter: The filter allows fluctuating measurement results to be smoothed.

- None — For rapid signals.
- 10 secs. — For most temperature controls.
- 30 secs. — For slow controls.
- 1 min. — For exterior temperatures and slow measurements without controls.

Probe type: The standardized probe types Pt1000 or Ni1000 can be used.

- 1-1	Delivers digital gross values, 10 or 12 bits.
- Pt 1000	For standardised Pt 1000 probes (IEC751).
- Pt100	For standardised Pt 100 probes with the PCD.W220-Z18 module
- Ni100	For standardised Ni 100 probes with the PCD.W220-Z18 module
- Ni 1000	For standardised Ni 1000 probes (DIN 43760).
- Ni 1000 L&S	For Ni 1000 probes from Landis & Stäfa
- F-T30	For F-T30 probes with the PCD2.W220-Z25 module
- NTC 10	For standardised NTC 10 probes with the PCD2.W220-Z02 module

Scaling range: Depending on the range selected, the value will be converted by linear interpolation.

-16...26 °C	For room temperatures.
- 20...80 °C	For hot water temperatures.
- -30,-10..+30°C	For exterior temperatures, -30..+30 for Pt + Ni and -10..+30 for NTC 10.
- 1-1	Delivers digital gross values, 12 bits.

Offset [K]: This parameter is used to compensate for cable length. Typical values for 100m cable (wire length 200m) of 1mm^2 at 20°C:
Pt 1000 probe = -0.9 K
Ni 1000 probe = -0.6 K

-----[Substitute value for faulty probes]-----

Substitute value 0..7: Output value 0..7 from Fbox in case of a faulty probe.

Scaling range: Various application areas:

1-1	Delivers 10 or 12 bit gross values and is used to test the converter.
16-26 °C:	Ambient temperatures (room temperature)
20-80 °C:	Hot water temperature for heating systems (supply temperature)
- -30,-10..+30 °C	Exterior temperatures.

This option does not represent a limit on the measured values, but defines the working points for scaling.

The measured value is converted by interpolation into a temperature within the selected range.

1.5 Parameterising the HeaVAC FBox for the PCD2/3.W400

The PCD2.W4 FBox is parameterised in the same way as the PCD2/3.W2xx FBox. The relevant options and settings can be taken from section 1.2.

One detail, not relevant to the programmer, is the lower resolution of 8 bits. As the conversion is carried out by the FBox, the programmer does not need to take this into account. However, if the application requires a higher resolution, a suitable module should be used.