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Originator MTX		Date 02.06.2006
“Safe Zero” – Difference between ARS 2000 and DIS-2		

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2 Introduction

The commands listed in this application note are covered by the servo positioning controllers of the ARS 2000 product line with the following product layer of standard firmware:

3.2.0.1.2

and are covered by the servo positioning controllers of the DIS-2 family with the following product layer of standard firmware:

1.0.0.1.1

If necessary please contact your supplier for updates or visit Metronix’s homepage at <http://www.metronix.de>.

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3 “Safe Zero” – Differences between ARS 2000 and DIS-2

The servo positioning controllers ARS 2000 and DIS-2 behave similar in wide ranges of their applications. One of the differences between both product lines is the performance of analogue inputs in respect of the performance of set “Safe Zero” and therefore the approachable setpoint settings.

The following chapters will explain the performance of “Safe Zero” with and without offset of both product lines ARS 2000 and DIS-2 more closely on the basis of examples.

3.1 “Safe Zero” with and without offset at ARS 2000

In illustration 1 you can see the individual characteristic line of the analogue input AIN0 for a rotation speed set value (in rounds per minute) in interconnection of the set voltage.

Basic settings for the example in illustration 1 for the analogue input AIN0 are: +10V which correspond to 1000 RPM.

- **Black dotted characteristic line – setpoint settings “Safe Zero” and without offset:**

The characteristic line shows the linear performance between the set voltage on the analogue input (up to 10 Volt) and out of this the resulting rotation speed set value (up to 1000 rpm).

Formula:

At AIN0 = +/- 10 Volt:

End rotation speed set value = +/- 10V (corresponding rotation speed set value in rpm)

Note:

The characteristic line should be classified as base characteristic line for other characteristic lines.

- **Red characteristic line – setpoint setting with “Safe Zero” and without offset:**

Symmetrically around point zero lies the area of “Safe Zero” with the set value of +/-1 Volt. In this area the rotation speed set value 0 rpm is being generated. Only if the voltage value at the analogue input AIN0 leaves the area of “Safe Zero”, the generated rotation speed set value goes to the value of the original characteristic line without “Safe Zero” (base characteristic line).

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Formula:

At AIN0 = +/- 10 Volt:

End rotation speed set value = +/- (10V corresponding rotation speed set value in rpm)

Note:

It is important that the area of “Safe Zero” has to be chosen in a way that the step to the original characteristic line is not too big respectively justifiable for the application.

In this example it means that the rotation values between –100 ... +100 rpm are not driven.

- **Blue characteristic line – setpoint settings “Safe Zero” and without offset:**
Symmetrically around point zero, which has been adjusted by the offset, lies the area of “Safe Zero” with the set value of +/-1 Volt. In this area the rotation speed set value 0 rpm is being generated. Only if the voltage value at the analogue input AIN0 leaves the area of “Safe Zero”, the generated rotation speed set value goes to the value of the original characteristic line without “Safe Zero” (base characteristic line), parallel adjusted by the offset value.
The end setpoint for rotation will be asymmetrical by the offset value.

Example in illustration 1:

AIN0 = +/- 10 Volt corresponding end rotation = +/-1000 rpm +250 rpm
= -750 ... +1250 rpm

Formel:

AIN0 = +/- 10 Volt:

rotation speed set value =

+/- (10V corresponding rotation speed set value in rpm)

+/- (Value offset in rpm)

Note:

It is important that the area of „Safe Zero” has to be chosen in a way that the step to the original characteristic line is not too big respectively justifiable for the application.

In this example it means that the rotation values between –100 ... +100 rpm are not driven.

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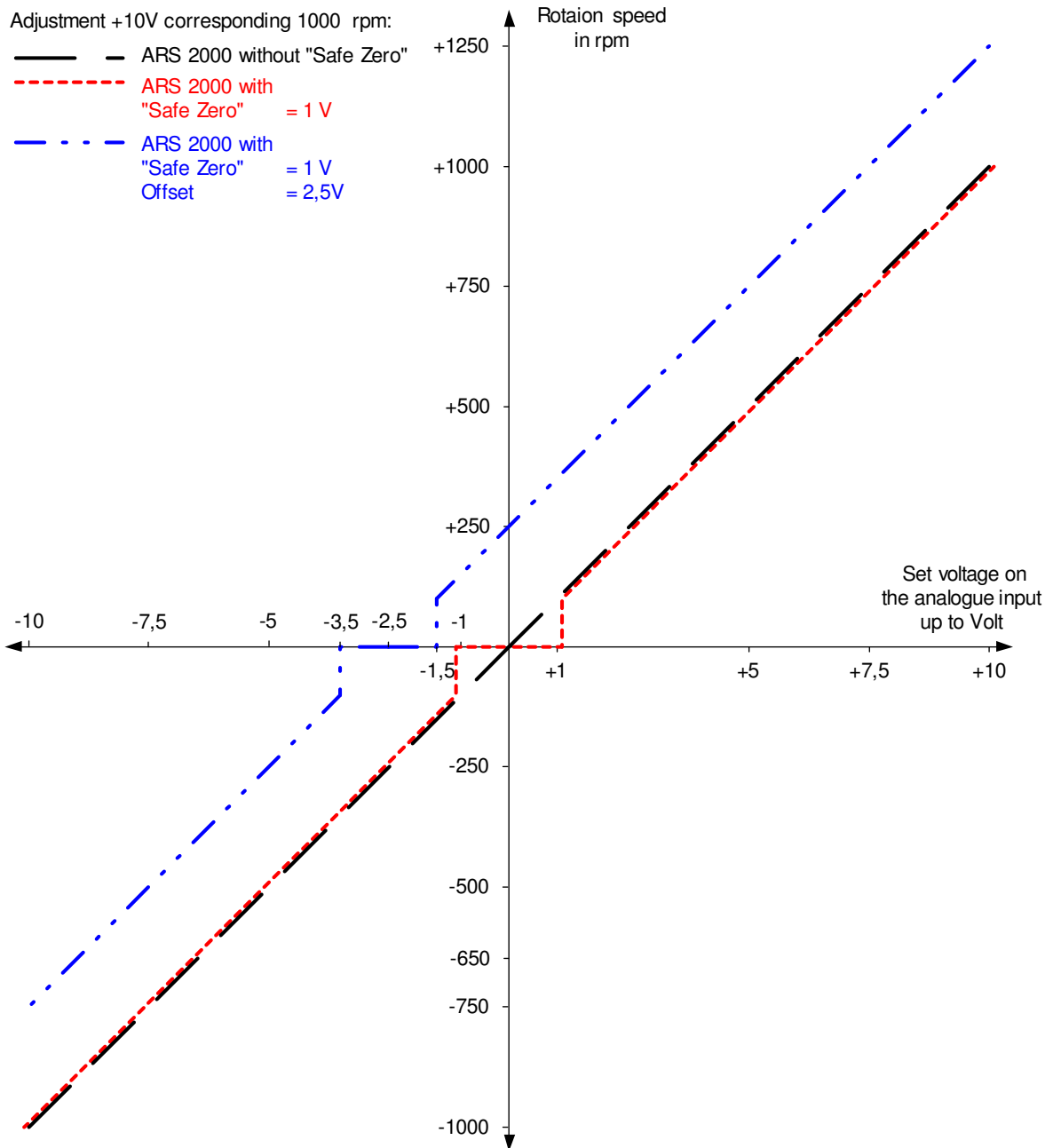


Illustration 1: “Safe 0” at ARS 2000

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3.2 “Safe Zero” with and without offset at DIS-2

In illustration 2 you can see the individual characteristic line of the analogue input AIN0 for a rotation speed set value (in rounds per minute) in interconnection of the set voltage.

Basic settings for the example in illustration 1 for the analogue input AIN0 are: +10V which correspond to 1000 RPM.

- **Black dotted characteristic line – setpoint settings without “Safe Zero” and without offset:**

The characteristic line shows the linear performance between the set voltage on the analogue input (up to 10 Volt) and out of this the resulting rotation speed set value (up to 1000 rpm).

Formula:

At AIN0 = +/- 10 Volt:

End rotation speed set value = +/- 10V (corresponding rotation speed set value in rpm)

Note:

The characteristic line should be classified as base characteristic line for other characteristic lines.

- **Red characteristic line – setpoint setting with “Safe Zero” “ and without offset:**

Symmetrically around point zero lies the area of “Safe Zero” with the set value of +/-1 Volt. In this area the rotation speed set value 0 rpm is being generated. Only if the voltage value leaves the area of the “Safe Zero”, the setpoint setting is generated to the value of the original characteristic line without “Safe Zero” (base characteristic line), starting at the initial value.

Example in illustration 2:

Input: +10 Volt correspond to +1000 rpm and „Safe Zero” = 1 Volt

Result: The start of the positive characteristic line is being parallel adjusted by +1 Volt („Safe Zero”) by the zero point and the end of setpoint is being reduced by the value of “safe 0”.

Formula:

At AIN0 = +/- 10 Volt:

End rotation speed set value =
 +/- (10V corresponding rotation speed set value in rpm)
 – (Value „Safe Zero” in rpm)

Note:

It is important that the area of „Safe Zero” has to be chosen in a way that the end rotation speed set value is justifiable for the application’s desired rotation incl the characteristic slope.

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- Blue characteristic line – setpoint setting with „Safe Zero” and offset**
Symmetrically around point zero, which has been adjusted by the offset, lies the area of „Safe Zero” with the set value of +/-1 Volt. In this area the rotation speed set value 0 rpm is being generated. Only if the voltage value leaves the area of the „Safe Zero”, the setpoint setting is generated to the value of the original characteristic line without “Safe Zero” (base characteristic line), starting at the initial value. Which is parallel adjusted by the offset value.

The end setpoints for rotation are being reduced asymmetrically by the value of offset and symmetrically by the value of „Safe Zero”, which the characteristic line would have reached without “Safe Zero” and offset (base characteristic line).

Example in illustration 2:

Input: +10 Volt correspond to +1000 rpm, “Safe Zero”= 1 Volt and offset = 2.5 Volt

Result: The start of the positive characteristic line is being parallel adjusted by +1 Volt („Safe Zero”) by the zero point and by the value of –2.5 volt (offset). The positive end of setpoint is being increased by the value of the offset and reduced by the value of “safe 0”.

(+10 Volt +2,5 Volt –1 Volt = +11,5 Volt correspond to +1150 rpm).

Formula:

AIN0 = +/- 10 Volt:

End rotation speed set value =

+/- (10V corresponding rotation speed set value in rpm)

+/- (value offset in rpm)

– (value „Safe Zero” in rpm)

Note:

It is important that the area of „Safe Zero” has to be chosen in a way that the end rotation speed set value is justifiable for the application’s desired rotation incl the characteristic slope.

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Adjustment +10V corresponding 1000 rpm:

- DIS-2 without "Safe Zero"
- - - DIS-2 with "Safe Zero" = 1 V
- . - . DIS-2 with "Safe Zero" = 1 V
Offset = 2,5V

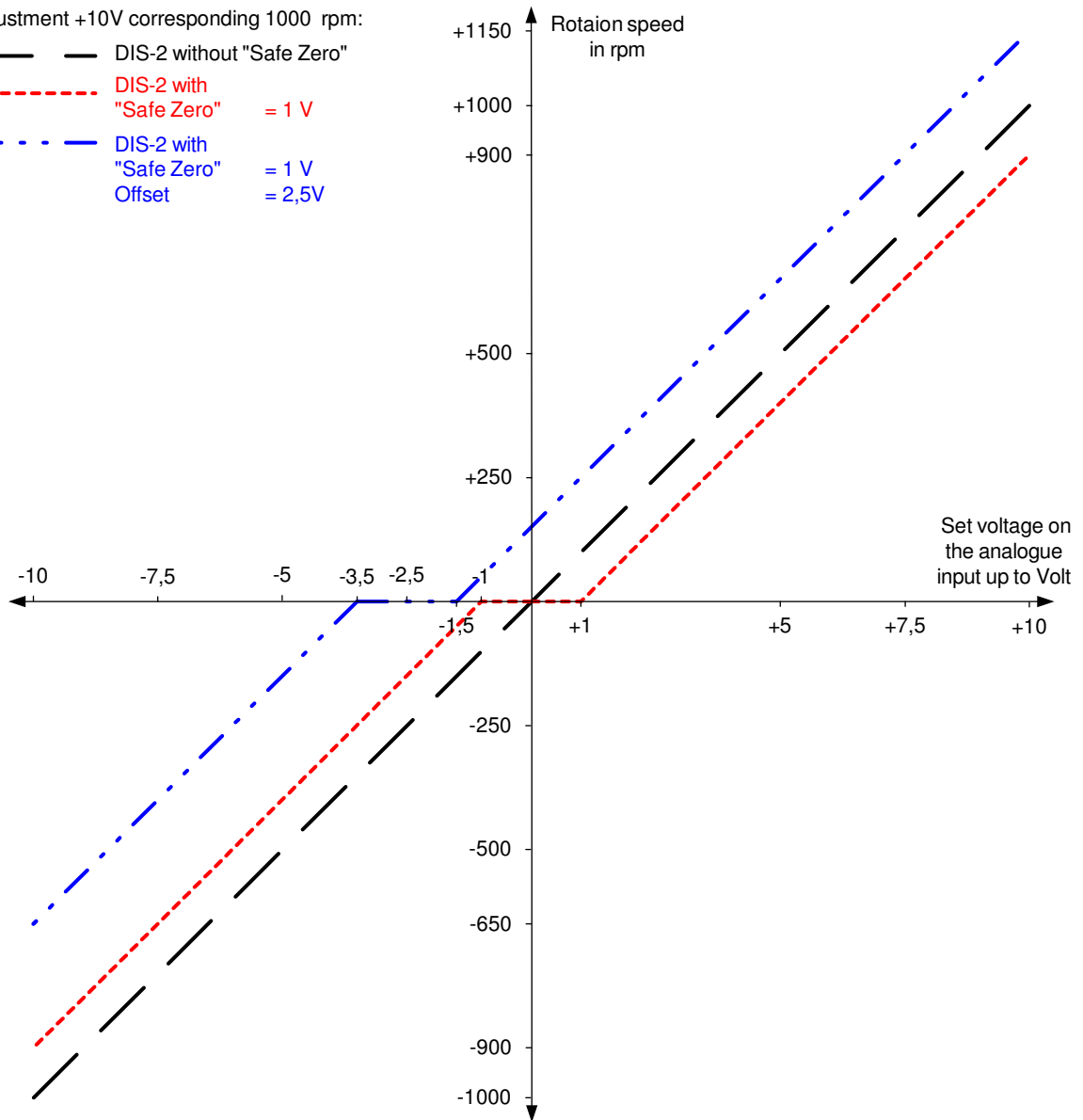


Illustration 2: „Safe Zero” at DIS-2