EWM-S-AA/20*
Digital Card

Start - up manual

Duplomatic Oleodinamica Spa

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GENERAL INFO

This manual displays information about the **digital card EWM-S-AA series 20** for stroke positioning control, here called EWM-S-AA

Identification code:
EWM-S-AA/20E

by Duplomatic Oleodinamica S.p.A.

Should you have any questions concerning just the card, please contact Duplomatic Oleodinamica S.p.A., indicating the description, the code and the serial number written in the label on case side.

Other useful literature about **EWM-S-AA/20** and its start-up can be found in:

Technical catalogue   **89410-ED edition 115**
Software pack   **EWMPC/20**

For installation, start-up, commissioning and maintenance use only skilled workers and materials fit for purpose, as recommended.

Before installation read this file and follow strictly what is indicated.

Duplomatic Oleodinamica disclaims any liability for damage to person or property resulting from noncompliance of rules and instructions here declared, from misuse or incorrect use or from tampering of provided cards.

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The **EWM-S-AA cards** are designed for an **easy stroke positioning control** of hydraulic actuators in closed loop systems.

The card controls a directional proportional valve, and allows an optimal use of overlapped and zero-overlapped proportional valves.

Velocities can be defined also by an external speed command.

Target positions are defined by the external command input, with an accuracy of approximate 0,01% of the sensor stroke.

EOUT function for the safety control of the actuator is internal. Failures are monitored with two digital output easy to read.

The deceleration characteristics can be defined as linear or square root characteristics function.

The actuator position is measured by an analog transducer and compared with a specified target position. The target position is adjusted with an external controller PLC.

Two operating modes can be selected:

SDD - **stroke depending deceleration**: the control gain will be adjusted with the parameters of direction of movement. This is a time optimal positioning structure with very high stability.

NC - **numeric control**: the position value is generated from the following error. The control gain will be adjusted acting on related parameters.

The card uses USB interface, and via software EWMPC it is possible to set the parameters.
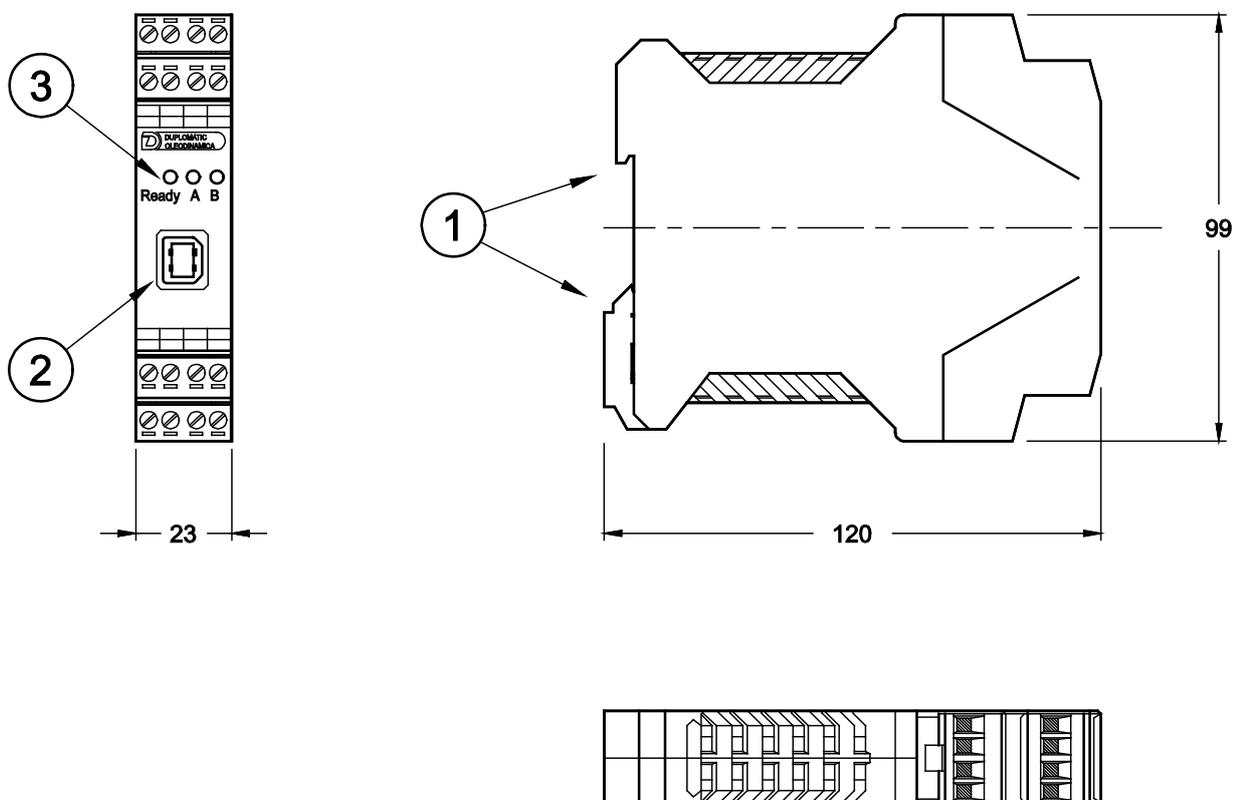
Technical Characteristics:

Power supply	V DC	12 ÷ 30 ripple included
Fuse, external	A	1A medium time lag
Current consumption	mA	< 100
Digital inputs	[V]	logic 0: <2
	[V]	logic 1: >10
Input resistance	[kOhm]	25
Digital outputs	[V]	logic 0: <2
	[V]	logic 1: >12 (50 mA)
Position accuracy	%	0,01
Command speed	V	0 ÷ 10 (RI = 90 kΩ)
	mA	4 ÷ 20 (RI = 240 Ω)
Feedback value	V	0 ÷ 10 (RI = 25 kΩ)
	mA	4 ÷ 20 (RI = 240 Ω)
Output value	V	2 x 0…10 V; differential output (10 mA max)
	mA	4…20 (max. load 390 Ohm)
Sample time	ms	1
Interface		USB-B (2.0)
Electromagnetic compatibility (EMC) according to 2004/108/EC		Emissions EN 61000-6-4: 6/2007; A1:2011 Immunity EN 61000-6-2: 8/2005
Housing material		thermoplastic polyamide PA6.6 - combustibility class V0 (UL94)
Connections		USB-B (2.0) 4x4 poles screw terminals - PE direct via DIN rail
Operating temperature range	°C	-20 / +60
Protection degree		IP 20

Installation instructions

- This module is designed for installation in a shielded EMC housing (control cabinet). All cables which lead outside must be screened; complete screening is required. It is also necessary to avoid strong electro-magnetic interference sources being installed nearby when using our open and closed loop control modules.

- **Typical installation location:** 24 V control signal area (close to PLC)
  The devices must be arranged in the control cabinet so that the power section and the signal section are separate from each other.
  Experience shows that the installation place close to the PLC (24 V area) is most suitable. All digital and analogue inputs and outputs are fitted with filters and surge absorbers in the device.

- The module should be installed and wired in accordance with the documentation bearing in mind EMC principles. If other consumers are operated with the same power supply, a star-shaped ground wiring scheme is recommended. The following points must be observed when wiring:
  - The signal cables must be laid separately from power cables.
  - Analogue signal cables **must be screened**.
  - All other cables must be screened if there are powerful interference sources (frequency converters, power contactors) and cable lengths > 3 m. Inexpensive SMD ferrites can be used with high-frequency radiation.
  - The screening should be connected to PE (PE terminal) as close to the module as possible. The local requirements for screening must be taken into account in all cases. The screening should be connected to at both ends. Equipotential bonding must be provided where there are differences between the connected electrical components.
  - If having longer lengths of cable (> 10 m), the diameters and screening measures should be checked by specialists (e. g. for possible interference, noise sources and voltage drop). Special care is required if using cables of over 40 m in length, and if necessary the manufacturer should be consulted if necessary.

- A low-resistance connection between PE and the mounting rail should be provided. Transient interference is transmitted from the module directly to the mounting rail and from there to the local earth.

- Power should be supplied by a regulated power supply unit (typically a PELV system complying with IEC364-4-4, secure low voltage). The low internal resistance of regulated power supplies gives better interference voltage dissipation, which improves the signal quality of high-resolution sensors in particular. Switched inductances (relays and valve coils) which are connected to the same power supply must <u>always</u> be provided with appropriate overvoltage protection directly at the coil.

Positioning structure

flow (volume) P→A and B→T
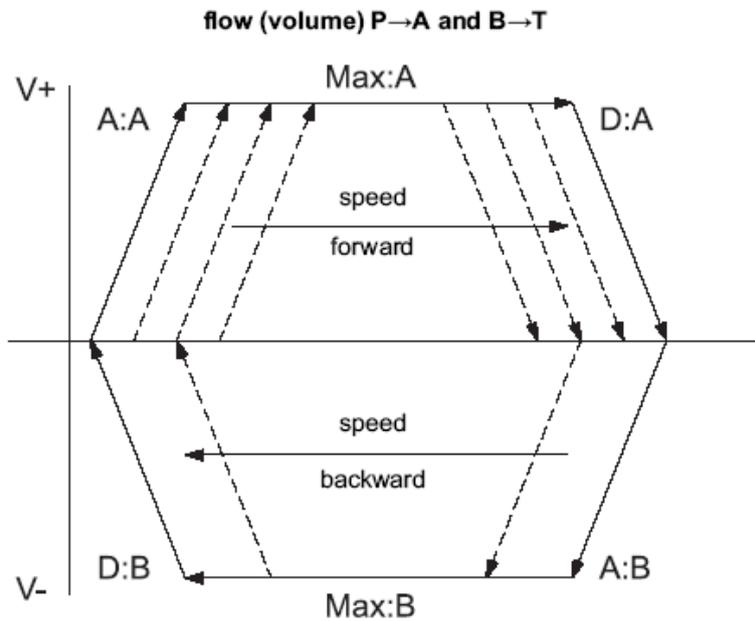
The positioning process will be controlled by switching inputs. After enabling (ENABLE input), the command position is set to the actual position of the sensor and the axis is in closed loop position control mode.

The READY output indicates a general ready for operation.

The axis now can be driven in manual mode (START is off) with the digital inputs HAND+ or HAND-. at set velocity.

When the HAND inputs are switched off, the command position is set to the actual position and the system is in closed loop position control mode.

With START input, the analogue command input (Pin 13) is active and new command positions will be taken over.

The axis is immediately driven to this new position and indicates, with the InPos output, when the axis is in position. The INPOS output is active as long as the axis is within the InPos window or the START input is active.

The positioning accuracy will almost be limited by the resolution of the transducer, and by the size of the hydraulic valve.

Therefore, the correct valve selection is the most important point. Additionally, two contradictory requirements (short positioning time and high accuracy) have to be considered in the system design.

LED

There are three LED on the front panel.

GREEN: Ready Output

      OFF: No power supply or ENABLE is not activated

      ON: System is ready for operation

      Flashing: Error discovered (Only active when SENS = ON)

YELLOW: A: Status output.

      OFF: The axis is outside the INPOS window.

      ON: The axis is within the INPOS window.

YELLOW: B: for alerts.

Led alerts

All LED

      chasing light : firmware update in progress. No normal functions are possible

      flashing light: every 6 seconds. An internal data error was detected and corrected automatically. The module still works regularly. To acknowledge the error the module has to be cycle powered.

Yellow LEDs only

      alternately flashing: inconsistent stored parameters.

To acknowledge the error, the data have to be saved with the SAVE command or the corresponding button in the WPC. If the function of the module has changed via the FUNCTION parameter, all parameters are deleted purposely and set to default values. In this case the LEDs indicate no error, but a desired state.

To acknowledge, save.

EWMPC/20 software pack

EWMPC/20 software is a graphical interface for digital communication and parameterizing the position card EWM-S-AA/20*; the same software is full of simple advanced diagnostic programs and oscilloscope with measure function.

The software allows the parameters to be saved and imported as needed for fast card replacement and for reduce the Start-up time system.

The software pack is available for download at http://www.duplomatic.com/en/download

SYSTEM REQUIREMENTS & Settings:

The program can be installed on every machine equipped with Microsoft OS: Windows XP, Windows 7 and Windows 8, a free USB port to connect the communication cable.
Default baud rate 57.6 kBaud.

Launch the setup file and follow the guided procedure to install the program and USB drivers. Complete driver setup and restart the machine if requested before connecting the module to the PC.

See software documentation (inside software pack) for EWMPC configuration.

PARAMETERS DESCRIPTION

Configuration

LG (language)

Command	Parameters	Default	Unit	Group
LG x	x= DE|EN	EN	–	STD

This command defines the language of text parameters. Deutsch (DE) / English (GB)
After changing the language setting the ID button in the menu bar must be pressed to see the modification.

MODE (Input MODE parameter)

Command	Parameters	Default	Unit	Group
MODE x	x= STD|EXP	STD	–	STD

This command defines the level of setting parameters. STANDARD / EXPERT mode. Default is STANDARD.

SENS (sensor monitoring)

Command	Parameters	Default	Unit	Group
SENS x	x= ON|OFF|AUTO	ON	–	STD

Activation of the sensor and internal failure monitoring.

ON: All monitoring functions are active. Detected failures can be reset by deactivating the ENABLE input.

OFF: No monitoring function is active.

AUTO: Auto reset mode. All monitoring functions are active. If the failure does not exist anymore, the module automatically resumes to work.

HAND (Manual speed)

Command	Parameters	Default	Unit	Group
HAND:i x	i= A|B x= –10000… 10000	3333 –3333	 0,01%	STD

With this parameter, the hand speed can be preset.
In case of a fault (position sensor fault), the drive can still be moved with the manual function. The output will be switched off when hand signals are turned off.

The drive moves in a controlled manner in the defined direction when the manual signal is active. The direction is defined by the sign of the parameters. After the manual signal has been disabled, the drive remains under control in the current position.

The hand speed is also limited by the internal or external velocity preset.

INPOS (in positioning window)

Command	Parameters	Default	Unit	Group
INPOS x	x= 2… 200000	200	µm	STD

This parameter is entered in µm.

The INPOS command defines a range for which the INPOS message is generated. This function monitors the failure between the command and actual position. If the failure is less than the programmed value a INPOS message at the status output (see Pin description).

The positioning process is not influenced by this message. PIN 7 (START) must be acivated to generate the INPOS messages

The positioning process is not influenced by this message. The controller remains active.

In NC-mode this message has to be interpreted alternatively as following error.

EOUT (output value by input failure)

Command	Parameters	Default	Unit	Group
EOUT x	x= –10000… 10000	0	0,01 %	EXP

When an input error occurs (e.g. sensor error) or the module is disabled this preset value is used to move the axis to one of the two end positions at a specified speed.

SENS must be ON or AUTO to use EOUT correctly.

Output value in case of ERROR is in percentage of maximum command signal (ratio is 0,01%).

|EOUT| = 0   The output is switched off in the event of an error. This is normal behavior.

Input signals

SYS_RANGE (Axis Working stroke)

Command	Parameters	Default	Unit	Group
SYS_RANGE x	x= 10… 10000	100	mm	STD

Corresponds to 100% of the input signal.
Speed and gain calculations depend on this value.

SIGNAL (type of input)

This command can be used to **change the type of** input signals, voltages (U) or current (I) and to define the polarity of the signal. This command is available for **all the analogue inputs**.

Command	Parameter		Default	Unit	Group
SIGNAL:i x	i= x=	W|X|V OFF U0-10 U10-0 I4-20 I20-4	U0-10	–	EASY

OFF= Deactivation of the input (useful to disable the external speed limit)

N_RANGE:X (sensor nominal length)

Command	Parameter	Default	Unit	Group
N_RANGE:X	x= 10… 200000	100	mm	EASY

N_RANGE (nominal range or nominal stroke) is used to define the **length of the sensor**.
This value should be always higher than SYS_RANGE (axis working stroke).
The control parameter cannot be calculated correctly in case of wrong values.

OFFSET:X (sensor offset)

Command	Parameter	Default	Unit	Group
OFFSET:X	x= –100000… 100000	0	μm	EASY

Adjustment of the **zero point of the sensor**.

Using of the commands SYS_RANGE, N_RANGE:X and OFFSET:X

The application scaling will be done by these three commands. In this example the system is defined by a length of 120 mm of the sensor, a working stroke of 100 mm of the cylinder and an offset of 5 mm. These parameters have to be typed in and the axis is driving between 5 mm and 105 mm of the sensor stroke and between 0 mm and 100 mm of the cylinder stroke.

Correct scaling:

SYS_RANGE   = 100   (mm)

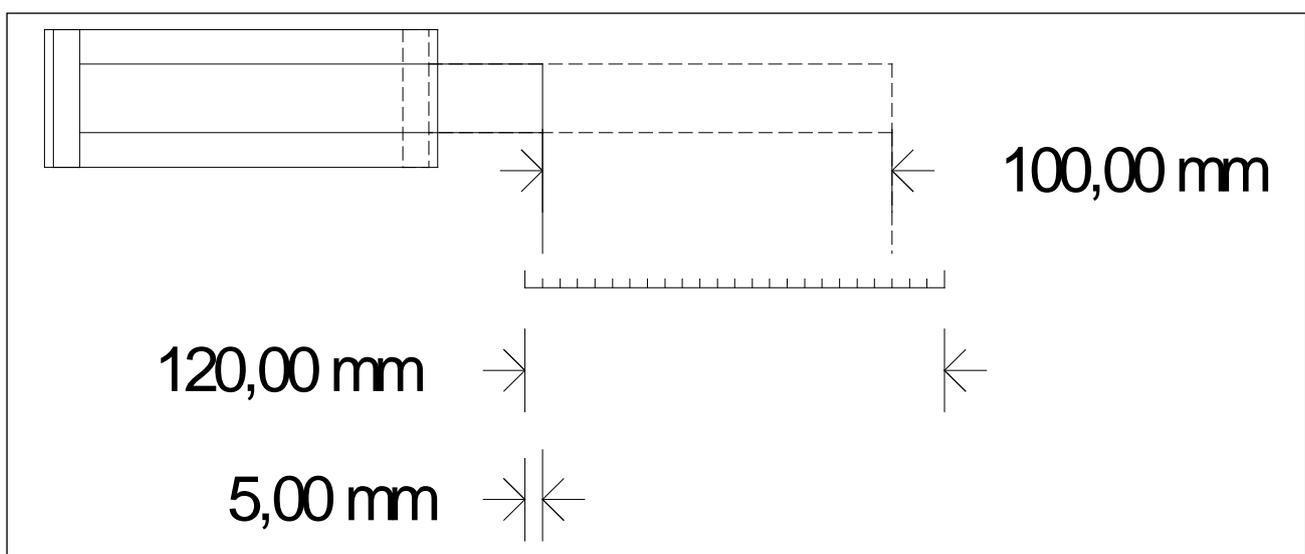N_RANGE:X   = 120   (mm)

OFFSET:X   = -5000 (μm)

Figure 1 (Input scaling of the sensor)

Closed loop control parameters

VELO (Input VELO parameter)

Command	Parameters	Default	Unit	Group
VELO x	x= 1… 10000	10000	0,01 %	STD SIGNAL:V = OFF

Here the maximum velocity can be limited internally if the velocity analog input is not used (SIGNAL:V = OFF)

VRAMP (Ramp time for external speed demand)

Command	Parameters	Default	Unit	Group
VRAMP x	x= 1… 5000	200	ms	SIGNAL:V = ON

The rate of change of the external speed demand can be limited by this ramp time. The command is only active if external speed demand (SIGNAL:V <> OFF) has been parameterized.

VMODE (Input VMODE parameter)

Command	Parameters	Default	Unit	Group
VMODE x	x= SDD|NC	SDD	–	EXP

The fundamental control structure can be changed with this parameter.

SDD: Stroke-Dependent Deceleration.

With stroke-dependent deceleration the drive comes to a controlled stop at the target position. From the deceleration setpoint the drive then switches to closed loop control mode and moves accurately to the desired position. This control structure is very robust and reacts insensitively to external influences such as fluctuating pressures. One disadvantage is that the speed varies with the fluctuating pressure as the system runs under open-loop control.

NC: Numerically Controlled.

Position profile is generated internally. The system always works under control and uses the following error to follow the position profile. The magnitude of the following error is determined by the dynamics and the closed loop gain. The advantage is that the speed is constant (regardless of external influences) due to the profile demand.

Because of continuous control, it is necessary not to run at 100 % speed, as otherwise the errors cannot be corrected. 70… 80 % of the maximum speed is typical although especially the system behavior and the load pressure should be taken into account when specifying the speed.

The output signal is directly limited in SDD mode. In NC mode the speed profile of the generator is limited. The lowest adjustable speed is 0,01 mm/s (VMAX = 1 mm/s and VELO = 1 %).

CTRL (braking characteristics)

Command	Parameters	Default	Unit	Group
CTRL x	x= LIN|SQRT1|SQRT2	SQRT1	-	STD

With this parameter, the braking characteristic of the hydraulic axis is controlled.

With positive overlapped proportional valves one of both SQRT braking characteristics should be used. The nonlinear flow curve of the valves is mostly linearized by the SQRT function.

If zero-overlapped proportional valves (control valves) are used, you can choose between LIN and SQRT1 according to the application. The progressive gain characteristic of SQRT1 has the better positioning accuracy.

According to the application there is maybe a longer braking distance, so that the total stroke time will be longer.

> **LIN**: Linear braking characteristics (control gain corresponds to: 10000 / d:i).

> **SQRT1**: Root function for the calculation for the braking curve. The control gain goes up quadratic with a small control error (control gain corresponds to: 30000 / d:i).
> This characteristic is preferably used with positive overlapped proportional valves.

> **SQRT2**: Root function for the braking curve calculation. The control gain goes up quadratic with a small control error (control gain corresponds to: 50000 / d:i).
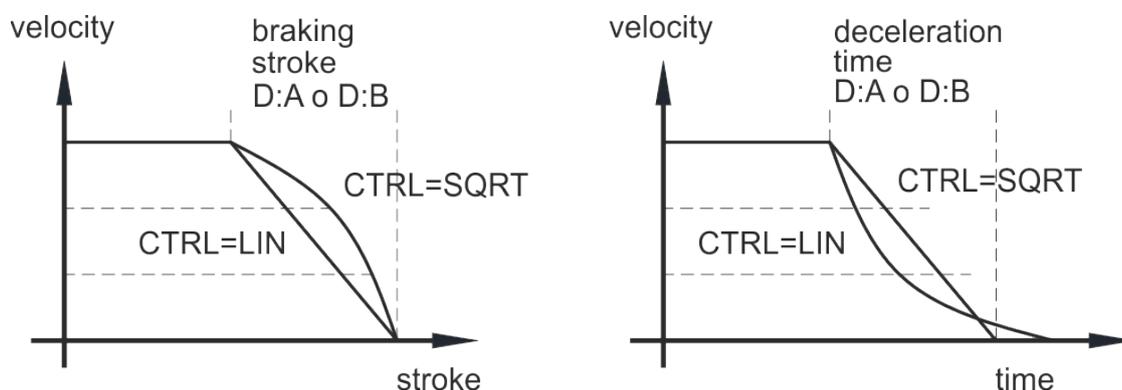
A (acceleration time)

Command	Parameters	Default	Unit	Group
A:i x	i= A|B x= 1… 5000	100|100	ms	VMODE=SDD

This parameter is set in milliseconds. The ramp time is separately set for driving output (A) and for driving output (B).

D (deceleration stroke or braking distance)

Command	Parameters	Default	Unit	Group
D:i x	i= A|B|S x= 1… 10000	25|25|10	mm	VMODE = SDD

This parameter is specified in mm.
The deceleration stroke is set for each **direction of movement** (**A** or **B**). The control gain is

calculated internally depending on the deceleration distance. The shorter the deceleration distance, the higher the gain. A longer deceleration distance should be specified in the event of instability.

Parameter **S** is used as the **stopping ramp** when disabling the START signal. After disabling, a new target position (current position plus D:S) is calculated in relation to the speed and is specified as a command value

$$G_{Intern} = \frac{STROKE}{D}$$

Calculation of control gain

If the maximum stroke (SYS_RANGE command) is changed, the deceleration distance must also be adjusted. Otherwise this can result in instability and uncontrolled movements.

In modules of series 10 this parameter was specified in % of the maximum stroke.

Since data specification for this module has now been converted to mm, the relationship between the stroke (SYS_RANGE command) and these parameters must be taken into account.

V0 (Loop gain setting)

Command	Parameters	Default	Unit	Group
`V0:i    x`	`i= A|B` `x= 1… 400`	`25|25`	s^{-1}	**VMODE = NC**

This parameter is specified in s^{-1} (1/s).
In NC Mode normally the loop gain is specified rather than the deceleration stroke.

The internal gain is calculated from this gain value together with the parameters VMAX and SYS_RANGE.

$$D_i = \frac{v_{max}}{V_0}$$

$$G_{Intern} = \frac{STROKE}{D_i}$$

Calculation of the internal control gain

In NC Mode the following error at maximum speed is calculated by means of the loop gain. This following error corresponds to the deceleration stroke with stroke-dependent deceleration. The conversion and therefore also the correct data demands related to the closed loop control system are relatively simple if the relationship described here is taken into account.

V0:RES (scaling of the loop gain)

Command	Parameters	Default	Unit	Group
`V0:RES    x`	`x= 1|100`	`1`	–	**VMODE = NC**

V0:RES = 1   loop gain in s^{-1} (1/s) units.   V0:RES = 100   loop gain in 0,01 s^{-1} units[1].

The increased resolution should be used in case of $V_0 < 4$.

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[1] In case of very low loop gains (1 s^{-1} to 3 s^{-1}) the better resolution of the adjustment should be selected.

ACCEL (Acceleration)

Command	Parameters	Default	Unit	Group
`ACCEL      x`	`x= 1… 20000`	`250`	`mm/s²`	**VMODE=NC**

This command is used to define the acceleration in NC mode only.

VMAX (maximum speed)

Command	Parameters	Default	Unit	Group
`VMAX       x`	`x= 1… 2000`	`50`	`mm/s`	**VMODE=NC**

This value is defined by the drive system and should be specified as precisely as possible (not too high under any circumstances). The speed is scaled by means of the VELO value or via the external speed demand. The command is only active if the VMODE has been parameterized to NC.

PT1 (Timing of the controller)

Command	Parameter	Default	Unit	Group
`PT1        x`	`x= 0… 300`	`1`	`ms`	**EXP**

This parameter can be used to change the internal timing of the control function.
Hydraulic drives are often critical to control especially in case of high speeds and very fast valves.
The PT1 filter can be used to improve the damping rate and allows therefore higher loop gains.

Output signals

MIN (compensation of the dead zone)

### MAX (maximum output signal)

TRIGGER (threshold value of MIN)

Command		Parameters	Default	Unit	Group
		i= A|B		–	STD
MIN:i	x	x= 0… 6000	0|0	0,01 %	
MAX:i	x	x= 3000… 10000	10000|10000	0,01 %	
TRIGGER	x	x= 0… 4000	200|200	0,01 %	

With this command, the **output signal is adjusted to the valve characteristics**. The positioning controllers have a double-gain characteristic curve instead of a typical overlapped jump. The advantage is a better and more stable positioning behavior. With this compensation, non-linear volume flow characteristic curves can be adjusted too.

⚠ **CAUTION!:** If these adjustments are available at the valve or at the valve electronics, it has to be guaranteed that the adjustment has to be carried out either at the power amplifier or at the positioning module.

If the MIN value is set too high, it influences the minimal velocity, which cannot be adjusted any longer. In extreme case this causes to an oscillating around the closed loop controlled position.
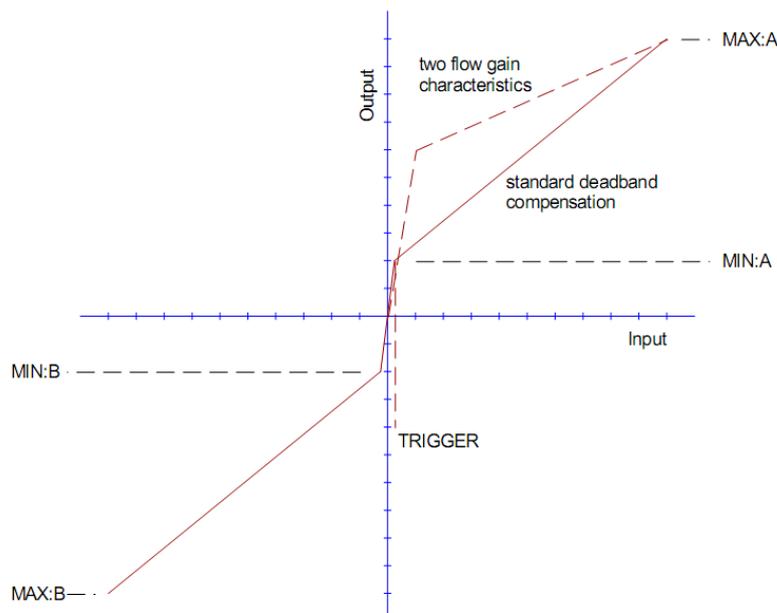
OFFSET (zero point adjustment)

Command	Parameters	Default	Unit	Group
OFFSET x	x= -4000… 4000	0	0,01 %	STD

This parameter is entered in 0,01% units.

The corresponding OFFSET will be added to the control error (demand value - actual value + offset).

With this parameter the zero point failure can be compensated.

SIGNAL:U (type and output polarity)

Command	Parameter	Default	Unit	Group

SIGNAL:U x	x= U+-10
	        I4-12-20
	        U-+10
	        I20-12-4
		U+-10	–	STD

This command is used to define the output signal (voltage or current) and to change the polarity2.

Differential output ± 100 % corresponds with ± 10 V (0… 10 V at PIN 15 and PIN 16).

Current output ± 100 % corresponds with 4… 20 mA (PIN 15 to PIN 12). 12 mA (0 %) = center point of the valve.

DC (Drift Compensation)

Command	Parameter	Default	Unit	Group
DC:AV x	x= 0… 2000	0	0,01 %	EXP
DC:DV x	x= 0… 1000	0	0,01 %	
DC:I x	x= 0… 2000	2000	ms	
DC:CR x	x= 0… 500	500	0,01 %	

Drift compensation is used to reduce particular type of positioning errors that happen when the axis is near to the target position above all for the following reasons:

1) Zero point adjustment of the valve
2) Zero point failure depending on the temperature
3) Position failure caused by an external force

Near to the target position the output signal is going lower and lower but a system specific position error remains. At the activation point (AV) this function – a slowly working integrator (I) – is active. This integrator signal is added to the output signal and will compensate offsets and other

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[2] The older POL command is removed.

failure. To prevent instabilities, the integrator value will be frozen when the output value is lower than the deactivation point (DV).

DC:AV

Activation threshold in 0,01%

This is the outer range for activation of this function, the smaller the better.

Typical value: 500. DC:AV = 0, function deactivated

DC:DV

Deactivation threshold in 0,01%,

This is the inner range for deactivation of this function.

Typical value: 500

DC:I

 Integrator in ms, i-gain in ms.

DC:CR

Control range in 0,01%

This is the output range of the drift compensation.

PROCESS DATA (monitoring)

Command	Description	Unit
WA	Input signal (Demand value)	mm
W	Command value (according to the profile generator)	mm
V	Velocity preset	%
X	Feedback value	mm
E	Error value	mm
C	Output of the controller	%
U	Output signal of the module	%
IA	Solenoid current A	mA (M Version only)
IB	Solenoid current B	mA (M Version only)

The process data can be read out now. They show the actual and command values.

APPENDIX 1: MATH displaying mode

With the advent of series 20 a new management of the signal settings is introduced. Anyway the previous scaling method is still available changing the proper parameter through Terminal window.

The command to use is: "AINMODE MATH"
To restore the standard visualization use: "AINMODE EASY"

The values of the parameters involved are not automatically converted.
Changing the AINMODE doesn't involve SIGNAL:V parameter .

AINMODE (Input scaling mode)

Command	Parameter	Default	Unit	Group
`AINMODE    x`	`x= EASY|MATH`	`EASY`	–	STD

This command is used to switch over the kind of input scaling and it's not visible on parameters table.
Terminal Window must be used.

AIN (input scaling via linear equation)

Command	Parameters	Default	Unit	Group
`AIN:i`	`i= W|X`			MATH
`A`	`a= -10000… 10000`	`666|666|0`	–	
`B`	`b= -10000… 10000`	`666|666|1000`	–	
`C`	`c= -10000… 10000`	`0|0|0`	`0,01 %`	
`X`	`x= V|C`	`V|V|V`	–	

With this command each input can be scaled individually. For the scaling function the following linear equation is taken.

$$y = \frac{a}{b} \cdot (x - c)$$

x is the input signal and *y* is the output signal.
At first, the offset (*c*) will be subtracted (in 0,01% units) from the input signal, then the signal will be multiplied with factor *a / b*.

With both these factors every floating point value can be simulated
(for example: 1.345 = 1345 / 1000).

With the *x* parameter value the internal measuring resistance for the current measuring (4…20mA) will be activated (V for voltages input and C for current input).

	AIN:xx	a	b	c	x
i with voltage (V):	AIN:i	1000	1000	0	V
i with current (C):	AIN:i	1250	1000	2000	C

Reverse acting sensor works from 10 V to 0 V.

AIN:xx	a	b	c	x
i with voltage (V):	AIN:I	-1000	1000	10000	V

Dialog box with AIN:W & AIN:X parameters

The AIN commands are special commands that allow to scale an input signal.

<u>Caution!</u> **If these commands are not set correctly the values displayed in the monitor tool may not correspond to the effective values.**

AIN:W scales the command position signal.

AIN: X scales the feedback signal.

The input signal type is defined with the buttons inside the presetting box.

<u>Verify the signal range</u> (see *HOW TO CALIBRATE* on the next page).

If the signal covers the whole range (current 4-20 mA or voltage 0-10 V) choose 4 - 20mA or 0-10V. The input field becomes unavailable and shows the preset values.

If the input signal range is different, (Es. 5- 18 mA) choose the 'user defined' button and enter the appropriate values in the fields.
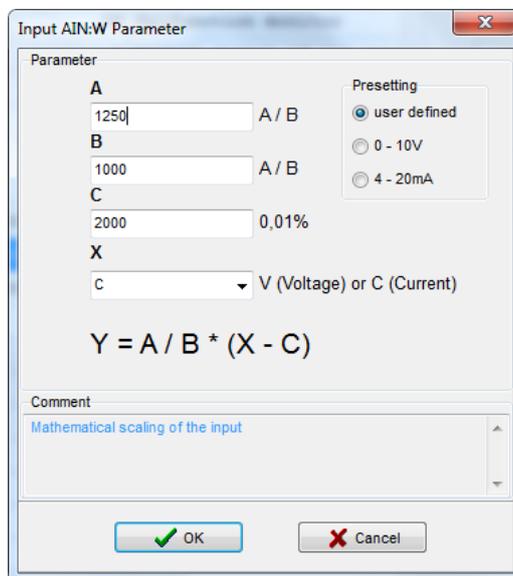
The amplification ratio is set with parameters **A** and **B**.

C defines the offset value.

The **X** variable defines the input type as current or voltage (*V* = voltage and *C* = current).

To correctly calculate the values, use the second sheet of the Excel file named

 'Input scaling - AIN command'

included in the EWMPC software pack. The Excel sheet is simple and intuitive to use.

	A	B	C	D	E	F	G	H
1	**Input scaling: current input 4… 20 mA**							
2								
3				Factor	a	b	c	x
4								
5	**Min value**	**5**	mA					
6	**Max value**	**18**	mA					
7	Current (default) 4… 20 mA			1,25	1250	1000	2000	C
8								
9	Scaling			1,54	1538	1000	2500	C
10								

values to enter

How to calibrate (user defining AIN parameters):

First, depending on the installed sensor model, verify that the forward/reverse acting configuration is according to the open/ close command of the actuator.

Move the cylinder in open loop (only ENABLE ON) with command *HAND+* and *HAND-.*

Moving can be done either with external manual controls (see Wiring Diagram in 89 410 ED datasheet), or via software, enabling the *Enable Remote Control* in the Monitor Tool.

Read the value of analog feedback; with this values you can calculate the linearization between feedback and command signal.

Formula : y = a / b * (x – c)

Current (X set as C):

IDEAL CONDITION:
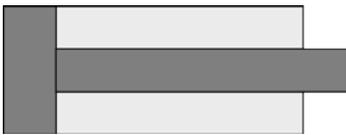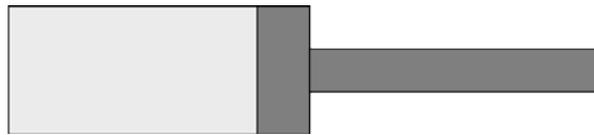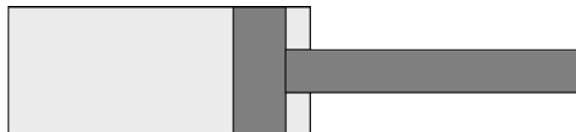

4mA **20mA**

AIN:X
A = 1.250
B = 1.000
C = 2.000

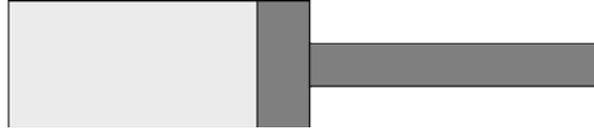REAL CONDITION:
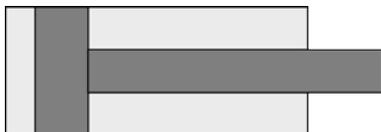
5mA **18mA**

Offset: 20mA = 100%   >   5mA = x
20 : 100 = 5 : x   >   x = 5 * 100 / 20 = 25 %   >   = 2.500

Gain =   20 / (18 – 5) = 1,54 = 1.538

AIN:X
A = 1.538
B = 1.000
C = 2.500

Voltage (X set as V):

IDEAL CONDITION:
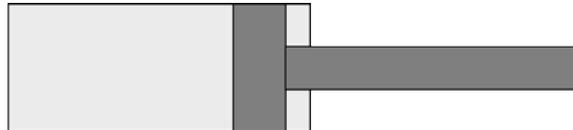
0V   10V

AIN:X   AIN:W

A = 1.000   A = 1.000
B = 1.000   B = 1.000
C = 0   C = 0
X = V   X = V

REAL CONDITION:

500mV (0,5V)   9,5V

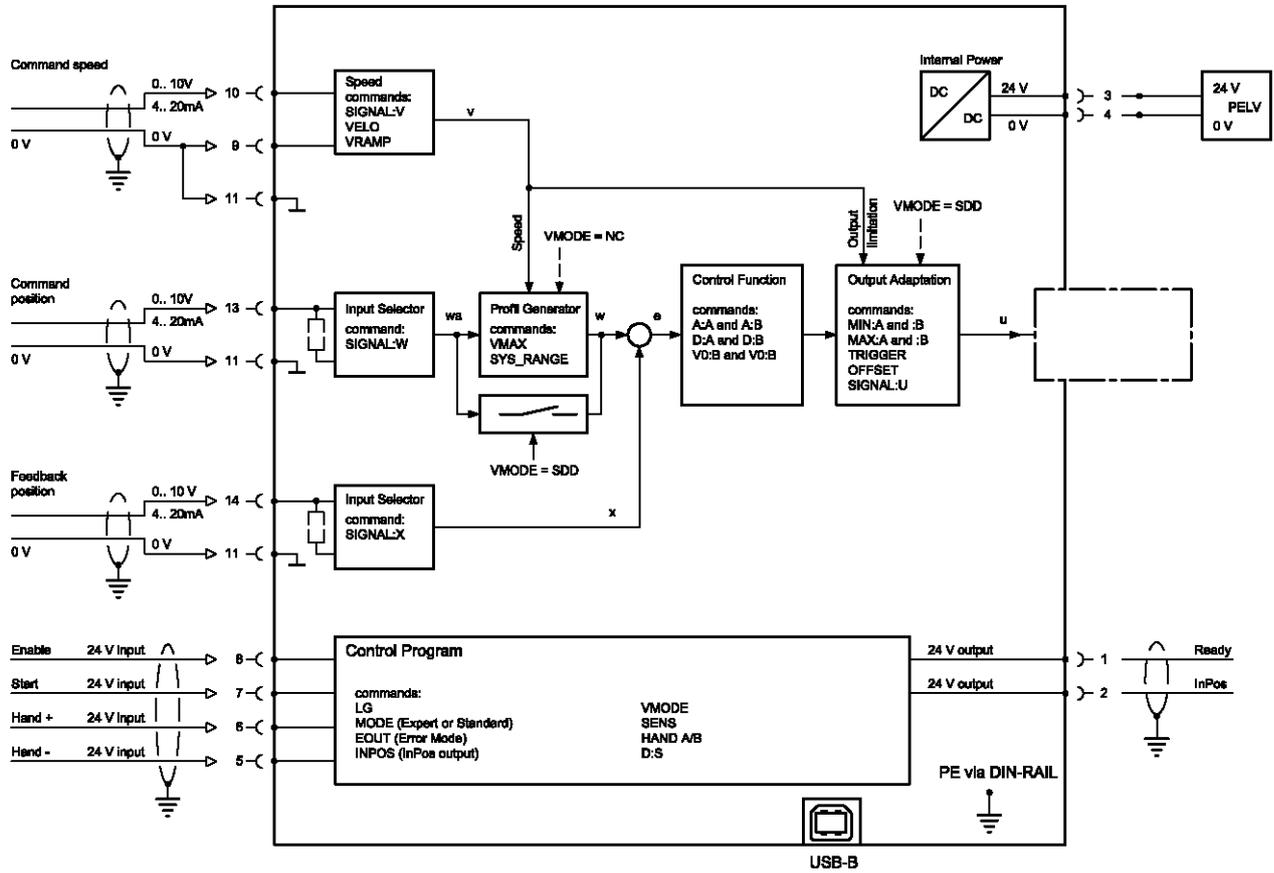Formula: 9,5 – 0,5 = 9 (9.000)   >   10.000 / 9.000 * 1.000 = 1.111
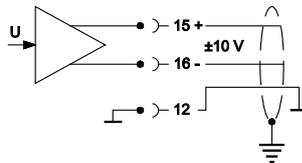
AIN:X   AIN:W
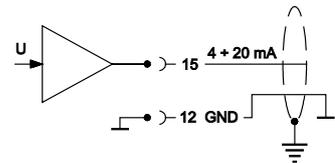
A = 1.000   A = 1.111
B = 1.000   B = 1.000
C = 0   C = 500
X = V   X = V

APPENDIX 2: Block Diagram

APPENDIX 3: Wiring