

EWM-ST-AA/21* Digital Card

Start - up manual

Diplomatic Oleodinamica Spa



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GENERAL INFO

This manual displays information about the **digital cards EWM-ST-AA series 21** for stroke positioning control in steam turbines applications, here called EWM-ST-AA

Identification codes:

EWM-ST-AA/21M1

EWM-ST-AA/21M2

EWM-ST-AA/21E1

by Diplomatic Oleodinamica S.p.A.

Should you have any questions concerning just the card, please contact Diplomatic 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-ST-AA /21** and its start-up can be found in:

Technical catalogue **89411-ED edition 117**

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.

Diplomatic 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-ST-AA cards** are designed for an **easy stroke positioning control** of hydraulic actuators in closed loop systems. Typical applications are positioning drives for steam turbines.

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.

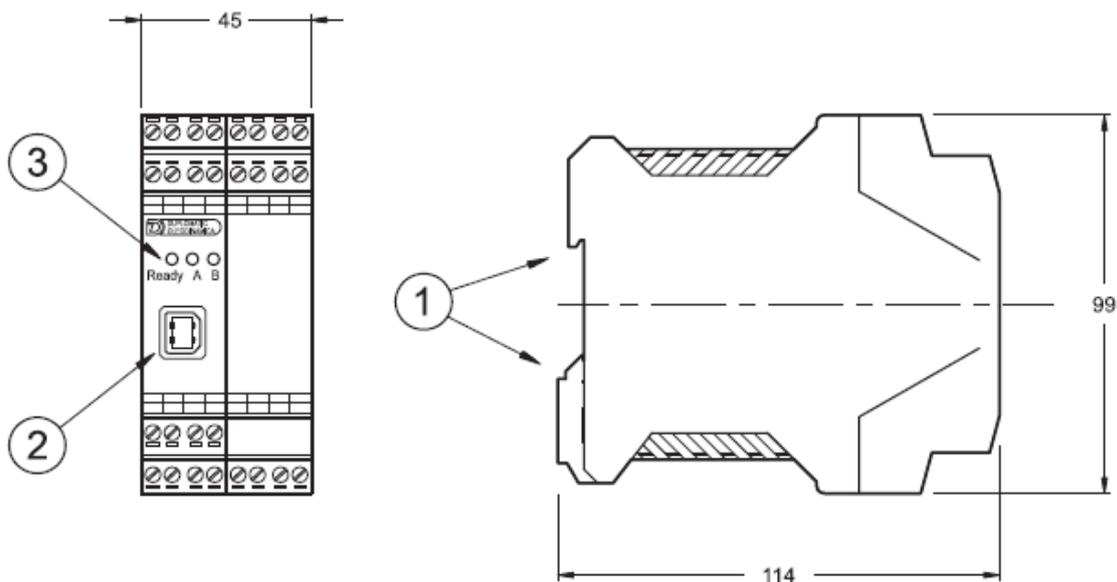
CUTOFF and EOUT functions for the safety control of the steam actuator are internal. Failures are monitored with two digital outputs easy to read.

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

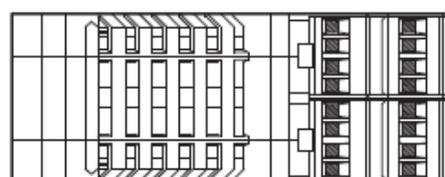
The actuator position is measured by an analogue transducer and compared with a specified target position. The target position is adjusted with an external controller PLC.

The control mode used is an SDD type - **Stroke Depending Deceleration**: the drive comes to a controlled stop at the target position. From the deceleration set point the drive then switches to closed loop control mode and moves accurately to the desired position. The control gain can be adjusted through the software modifying deceleration parameters. This is a time optimal positioning structure with very high stability.

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



1	DIN EN 50022 rail type fastening
2	USB interface, for setup
3	LEDs for output signals



Technical Characteristics

Power supply	V DC	12 ÷ 30 ripple included
Fuse, external: M1 and M2 E1		3A medium time lag 1A medium time lag
Current consump.: M1 and M2 E1	A mA	3 < 100
Command position value	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 25 kΩ)
Position accuracy	%	0,01
Command speed	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 90 kΩ)
Feedback value	mA V	4 ÷ 20 (RI = 240 Ω) 0 ÷ 10 (RI = 25 kΩ)
Output value M1 and M2 E1	mA	500 ÷ 2600 4 ÷ 20
Sample time	ms	1
Interface		USB-B (2.0)
Electromagnetic compatibility (EMC)		Emissions EN 61000-6-4 Immunity EN 61000-6-2
Housing material		thermoplastic polyamide PA6.6 - combustibility class V0 (UL94)
Connections		USB-B (2.0) 7x4 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.

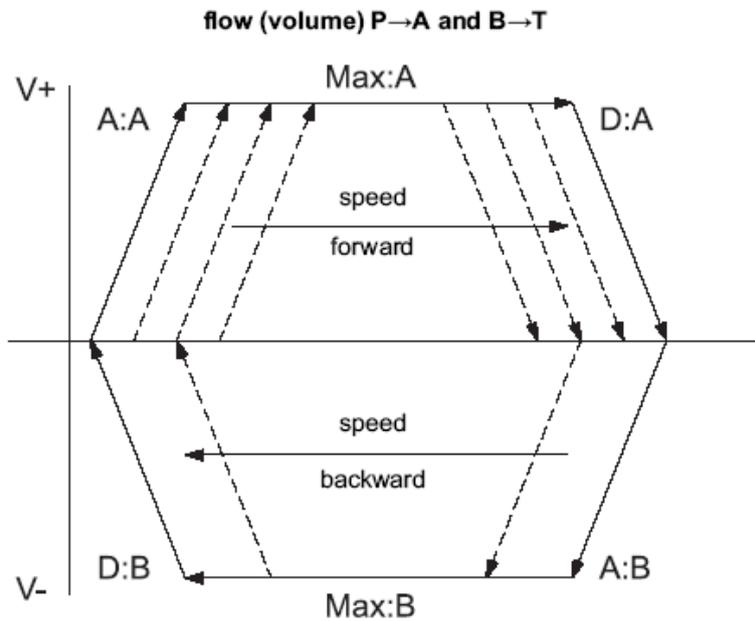
The module should be installed and wired in accordance with the documentation bearing in mind EMC principles. If other consumers are operated with the same power supply, a star-shaped ground wiring scheme is recommended. The following points must be observed when wiring:

- 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 IEC 60364-4-44, 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 always be provided with appropriate overvoltage protection directly at the coil.

Positioning structure



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-ST-AA/21*; 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 to reduce the Start-up time system.

NOTICE: set of parameters generated from previous firmware releases can generate a warning popup that warns of possible non-compatibility of the parameters set.

This is just an alert: the set can be load pressing the OK button, and then you have to check the imported list. Then save to get a new .wpc file compatible with the latest firmware release.

The obtained .wpc file can be saved on your laptop for future use, avoiding to repeat this procedure with other modules.

The software pack is available for download at

http://www.diplomatic.com/en_US/download/software-download/



SYSTEM REQUIREMENTS & Settings:

The program can be installed on every machine equipped with Microsoft OS: Windows XP, Windows 7, Windows 8 and Windows 10 and a free USB port to connect the communication cable. Default baud rate 57.6 baud.

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)

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)

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

SENS (sensor monitoring)

Command	Parameters	Unit	Group
SENS x	x= ON OFF AUTO	-	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.

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

OFF: No monitoring function is active.

Following possible error sources are monitored continuously when SENS = ON/AUTO:

Source	Fault	Characteristic
Command signal PIN 13 4... 20 mA	Out of range or broken wire	The output will be switched off.
Feedback signal PIN 14 4... 20 mA	Out of range or broken wire	The output will be switched off.
M1 and M2-VERSION Solenoids on PIN 17-20	Wrong cabling, broken wire	The power stage will be deactivated.
EEPROM (when switching on)	Data error	The output is deactivated. The module can only be activated by saving the parameters again



CAUTION: Take care of the EOUT command. Changes will influence the behaviour.

HAND (Manual speed)

Command	Parameters	Unit	Group
HAND:i x	i= A B x= -10000... 10000	0,01%	STD

With this parameter, the hand speed can be pre-set.

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 pre-set.

INPOS (in positioning window)

Command	Parameters	Unit	Group
INPOS x	x= 2... 2000	0,01 %	STD

This parameter is entered in 0,01%.

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 activated to generate the INPOS messages

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

Input signals

SYS_RANGE (Axis Working stroke)

Command	Parameters	Unit	Group
SYS_RANGE x	x= 10... 10000	0,01 %	STD

Corresponds to 100% of the input signal.
Keep this parameter equal to 10000.

SIGNAL:V (velocity signal - type of input)

For **speed command** the selection is limited as below

Command	Parameter	Unit	Group
SIGNAL:V x	x= OFF U0-10 U10-0 I4-20 I20-4	-	EASY

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

AIN (input scaling via linear equation)

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	Parameters	Unit	Group
AIN:i	i= W X		MATH
A	a= -10000... 10000	-	
B	b= -10000... 10000	-	
C	c= -10000... 10000	0,01 %	
X	x= V C	-	

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:l	-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.

Caution! 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.

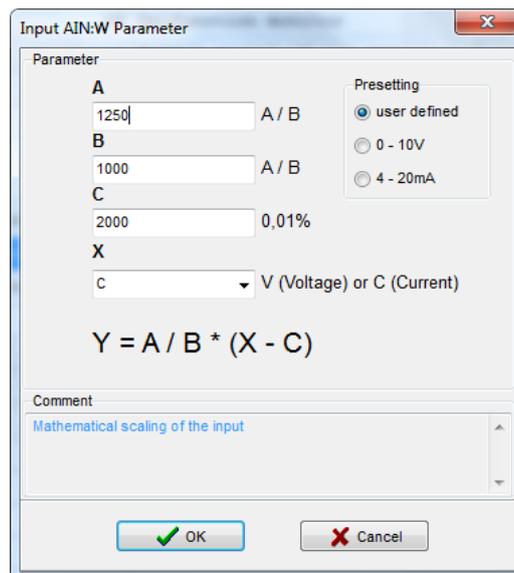
AIN: X scales the feedback signal.

The input signal type is defined with the buttons inside the pre-setting box.

Verify the signal range (see *HOW TO CALIBRATE* on the next page).

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

If the input signal range is different, (Es. 5- 18mA) 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.xls' 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				<i>Factor</i>	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					<i>values to enter</i>			
9	Scaling			1,54	1538	1000	2500	C
10								

Closed loop control parameters

VELO (Input VELO parameter)

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

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

VRAMP (Ramp time for external speed demand)

Command	Parameters	Unit	Group
VRAMP x	x= 10... 5000	ms	SIGNAL:V

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.

CTRL (braking characteristics)

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

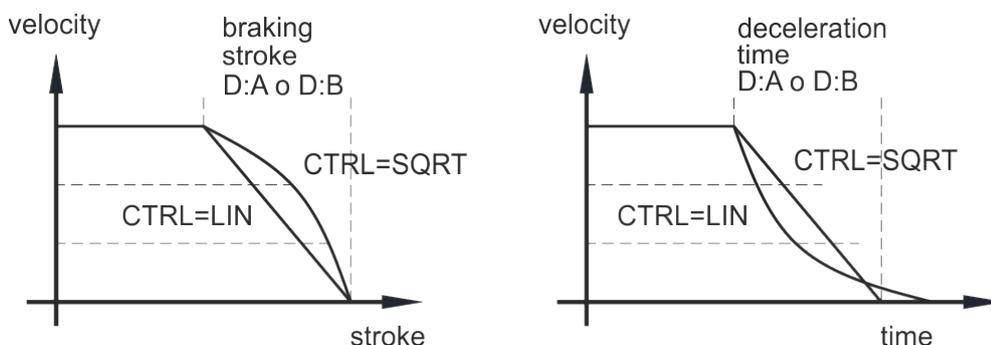
The deceleration characteristic is set with this parameter. In case of positively overlapped proportional valves the SQRT function should be used. The non-linear flow function of these valves is linearized by the SQRT1 function.

In case of zero lapped valves (control valves and servo valves) the LIN or SQRT1 function should be used regardless of the application. The progressive characteristic of the SQRT1 function has better positioning accuracy but can also lead to longer positioning times in individual cases.

LIN: Linear deceleration characteristic (gain is increased by a factor of 1).

SQRT1: Root function for braking curve calculation. The gain is increased by a factor of 3 (in the target position). This is the default setting.

SQRT2: Root function for braking curve calculation. The gain is increased by a factor of 5 (in the target position). This setting should only be used with a significantly progressive flow through the valve



¹ The SQRT function generates constant deceleration and thus reaches the target position faster. This is achieved by increasing the gain during the deceleration process.

A (acceleration time)

Command	Parameters	Unit	Group
A:i x	i= A B x= 1... 5000	ms	STD

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	Unit	Group
D:i x	i= A B S x= 1... 10000	0,01 %	STD

This parameter is specified in 0,01%.

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.

$$Gain_i \propto \frac{1}{D:i}$$

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.

PT1 (Timing of the controller)

Command	Parameter	Unit	Group
PT1 x	x= 0... 300	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.

ST special functions

EOUT (output value by input failure)

Command	Parameters	Unit	Group
EOUT x	x = -10000... 10000	0,01 %	STD

When an input error occurs (e.g. sensor error) or the module is disabled this pre-set 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 behaviour.

EOUTMODE (Selecting EOUT activating incident)

Command	Parameters	Unit	Group
EOUTMODE x	X = NOENABLE ERROR	-	STD

This command changes the relating incident for activating the EOUT value.

NOENABLE: Standard behaviour of EWM control modules. If the READY signal is not available, the value which is set in EOUT parameter is given to the output.

Consequently, this condition happens not only in case of an occurred error but also if the ENABLE signal is not set.

ERROR: The EOUT value is given to the output when an error has occurred and the ENABLE signal is available.

ATTENTION: The option ERROR depends on the SENS command. If the monitoring is active, an occurred error is only a relating incident. Deactivating monitoring by setting SENS to OFF means ignoring errors. This is also responsible for the EOUT command. This behaviour should be identically to that in the former version.



CAUTION: In case of an occurring error, the control output on **PIN 16** doesn't switches off totally. **In OFF mode (EOUT = 0) it provides 12 mA.**

CUTOFF (Input CUTOFF parameter) / CUTVAL (Input CUTVAL parameter)

The cut-off function manages the function of forced closure or opening of the cylinder, referring to the parameter range set.

Command	Parameters	Unit	Group
CUTOFF x	x= 0... 2000	0,01 %	STD
CUTVAL x	x= -10000... 10000	0,01 %	STD

CUTOFF - This command defines **when** the cut-off function will be activated, in 0,01%

CUTVAL - This command defines the **velocity** of the cut-off action, in 0,01%

CUTOFF value must be added or subtracted to the starting or final position value, depending on the direction. The direction is defined with a +/- sign in the CUTVAL parameter.

example:

setting the CUTOFF = 100 and CUTVAL = -5000

means that if the command position is into the range 0 - 1%, the target will be kept at 0%.

This target will be reached with a velocity depending on CUTVAL value.

Output signals

MIN (compensation of the dead zone)

MAX (maximum output signal)

TRIGGER (threshold value of MIN)

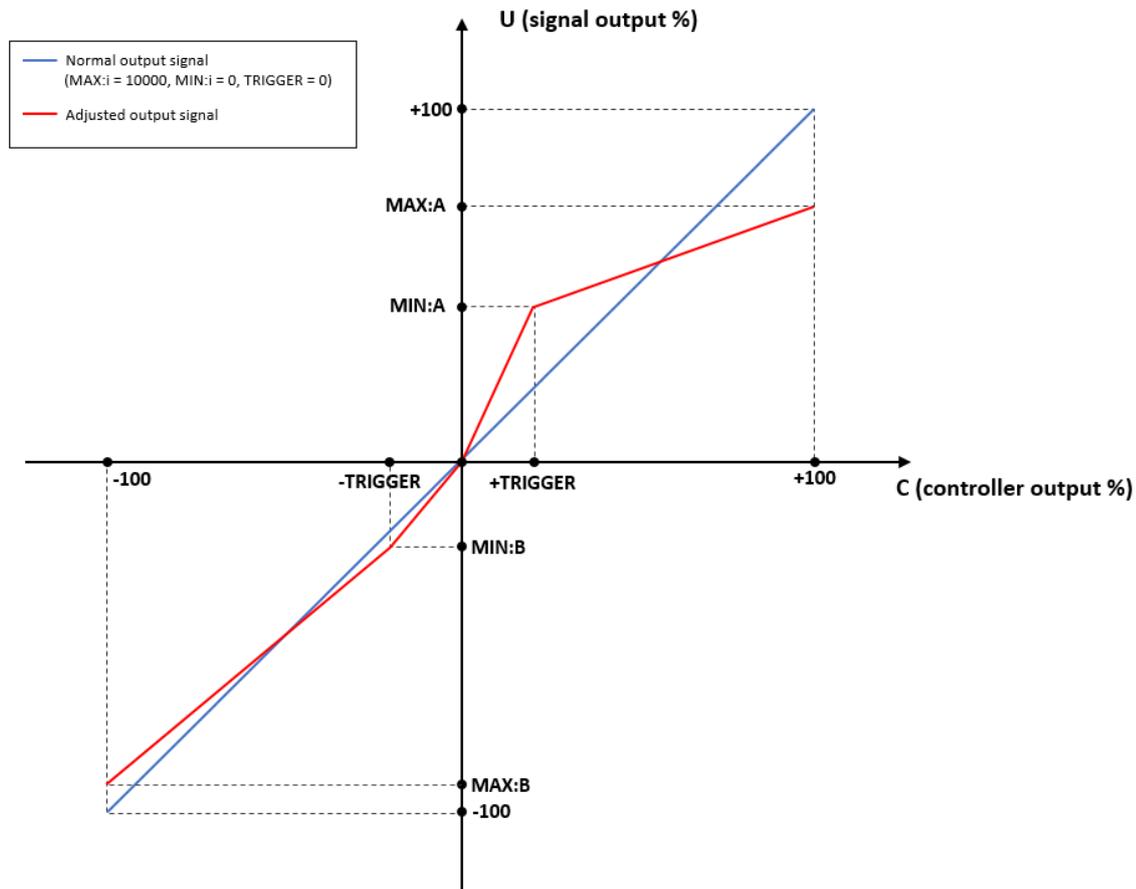
Command	Parameters	Unit	Group
	i= A B	-	STD
MIN:i x	x= 0... 6000	0,01 %	
MAX:i x	x= 3000... 10000	0,01 %	
TRIGGER x	x= 0... 4000	0,01 %	

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 behaviour. With this compensation, non-linear volume flow characteristic curves can be adjusted too.



CAUTION! If there exist also possibilities for adjustments at the valve or at the valve electronics, it has to be guaranteed, that the adjustment has to be carried out 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.

**Notes:**

C and U are process variables. Check the block diagram at the end of this manual for the meaning.

OFFSET supposed = 0

SIGNAL:U supposed = +

OFFSET (zero-point adjustment)

Command	Parameters	Unit	Group
OFFSET x	x= -4000... 4000	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 (output polarity)

Command	Parameter	Unit	Group
SIGNAL:U x	x= +/-	-	STD

The output polarity of the controller can be switched over.

SIGNAL:M (monitor output)

Command	Parameter	Unit	Group
SIGNAL:U x	x= U0-10 I4-20	-	STD

The monitor output can be selected in voltage or current.

DC (Drift Compensation)

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

Close 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 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.

M1 and M2 additional parameters

CURRENT

Command	Parameters	Unit	Group
CURRENT x	X = 500... 2600	mA	STD

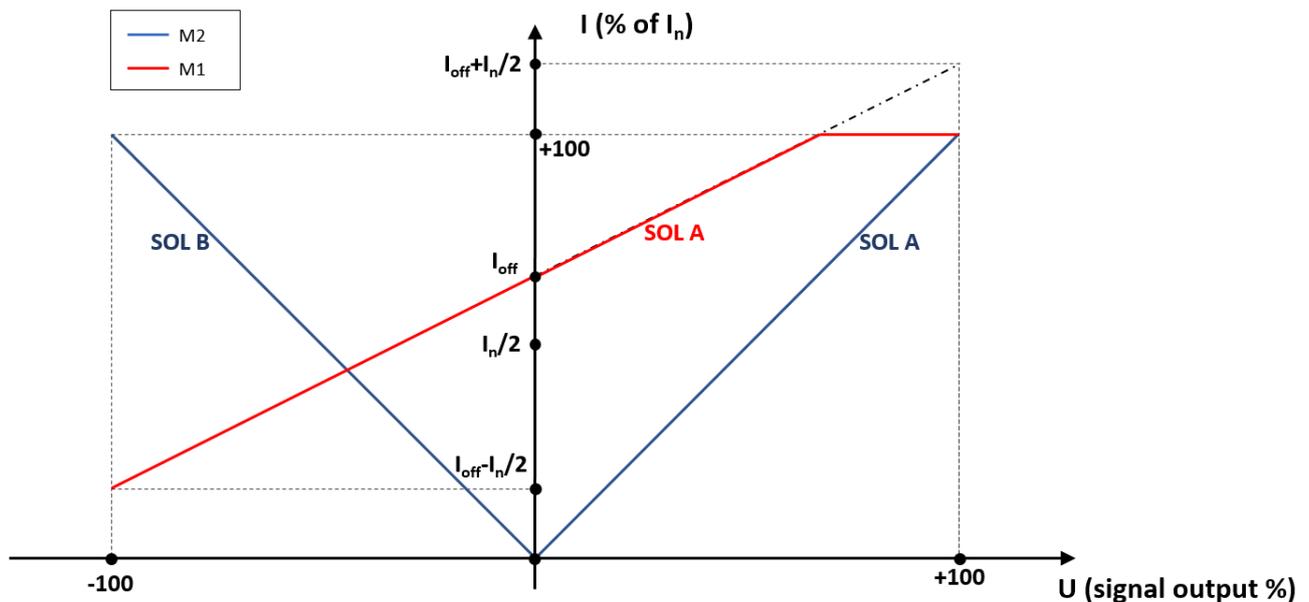
This command defines the selection of the rated current output between 500 and 2600 mA.

CURR_OFFSET

Command	Parameters	Unit	Group
CURR_OFFSET x	X = 0... 10000	0.01%	STD (M1 only)

This command is applicable to single solenoid valves only.

It's the parameter for current value adjustment to be set to obtain the hydraulic null.



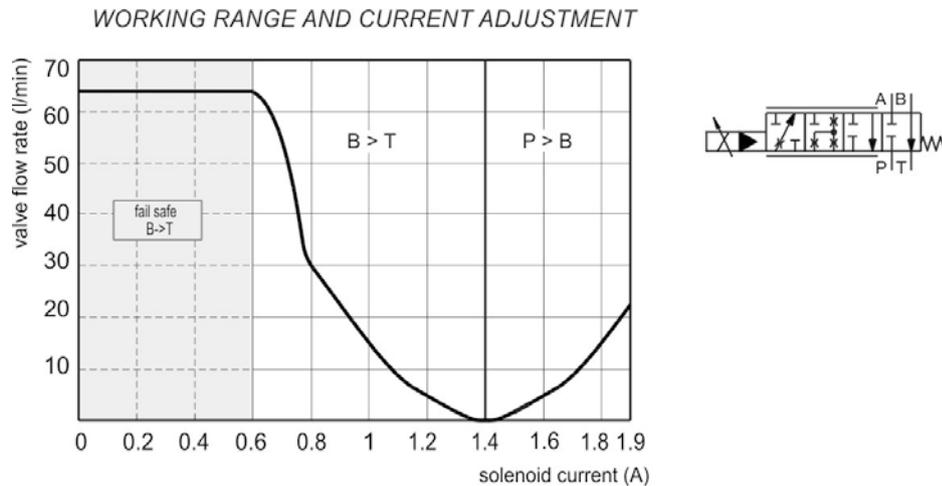
Notes:

I_n set by CURRENT parameter

I_{off} set by CURR_OFFSET parameter

U range can be adapted by the use of compensation parameters (MAX:i, MIN:i, TRIGGER)

Here below, an example of a valve behaviour.



DAMPL (dither amplitude)

Command	Parameters	Unit	Group
DAMPL	x	x= 0... 3000	0,01%

Dither amplitude in 0,01% of the rated current

DFREQ (dither frequency)

Command	Parameters	Unit	Group
DFREQ	x	x= 60... 400	Hz

PWM

Command	Parameter	Unit	Group
PWM	x	x= 61... 2604	Hz

PWM frequency in Hz. PPWM and IPWM have to be adapted accordingly to this value.

ACC (auto PI ON-OFF)

Command	Parameter	Unit	Group
ACC	x	x= ON OFF	-

Operation mode of the closed loop current control.

ON: In automatic mode PPWM and IPWM are managed depending on the pre-set PWM-frequency.

OFF: Manual adjustment.

PPWM (P-Gain)

Command	Parameter	Unit	Group
PPWM	x	x= 0... 30	-
			STD

Changes should be only done with good experience in optimizing of current loops. Default is 3.

If ACC = ON these adjustments are done automatically and this value is not editable.

If the PWM Frequency is below 250 Hz, typically PPWM 1 – 3.

If the frequency is above 1000Hz PPWM = 7 should be chosen.

ATTENTION: The dither amplitude must be optimized after this tuning.

IPWM (I-Gain)

Command	Parameter	Unit	Group
IPWM	x	x= 1... 100	-
			STD

Changes should be only done with good experience in optimizing of current loops. Default is 40.

If ACC = ON these adjustments are done automatically and this value is not editable.

If the PWM Frequency is below 250 Hz, typically IPWM 40 – 80.

If the frequency is above 1000Hz IPWM = 40 should be chosen.

ATTENTION: The dither amplitude must be optimized after this tuning.

PROCESS DATA (monitoring)

Command	Description	Unit
WA	Input signal (Demand value)	%
W	Command value (according to the profile generator)	%
V	Velocity pre-set	%
X	Feedback value	%
E	Error value	%
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: EASY displaying mode

With the advent of series 20 a new management of the signal settings is introduced.

This setting, named EASY, makes the parameters of the signals simpler to use but less flexible than classic mode, named MATH, (i.e. scaling is not possible).

The command to use is: "AINMODE EASY"

To restore the standard visualization use: "AINMODE MATH"

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	Unit	Group
AINMODE x	x= EASY MATH	-	

SIGNAL (input signal)

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

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.

OFFSET:X (sensor nominal length)

Command	Parameter	Unit	Group
OFFSET:X	x= -700... 1000	0,01 %	EASY

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

APPENDIX 2: 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-*.

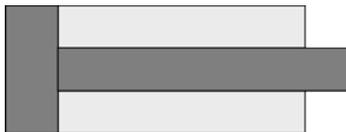
Moving can be done either with external manual controls (see Wiring Diagram in 89 411/315 ED datasheet), or via software, enabling the *Enable Remote Control* in the Monitor Tool.

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

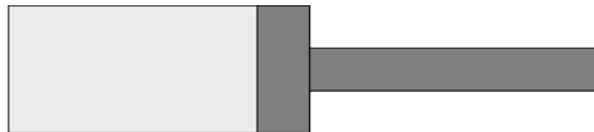
$$\text{Formula : } y = a / b * (x - c)$$

Current (X set as C):

IDEAL CONDITION:



4mA



20mA

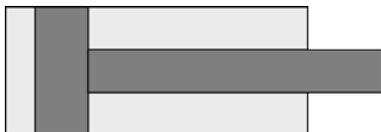
AIN:X

$$A = 1.250$$

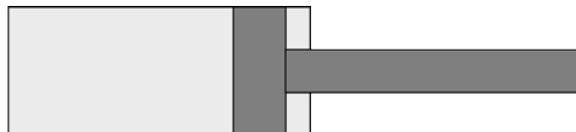
$$B = 1.000$$

$$C = 2.000$$

REAL CONDITION:



5mA



18mA

$$\text{Offset: } 20\text{mA} = 100\% \quad > \quad 5\text{mA} = x$$

$$20 : 100 = 5 : x \quad > \quad x = 5 * 100 / 20 = 25\% \quad > \quad = 2.500$$

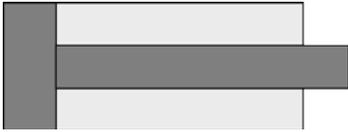
$$\text{Gain} = 20 / (18 - 5) = 1,54 = 1.538$$

AIN:X

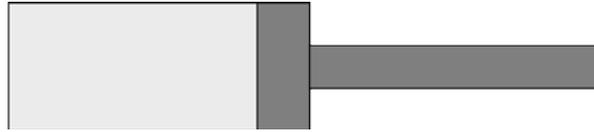
$$A = 1.538$$

$$B = 1.000$$

$$C = 2.500$$

Voltage (X set as V):IDEAL CONDITION:

0V



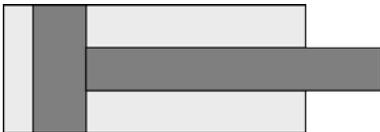
10V

AIN:X

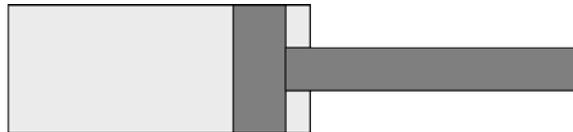
A = 1.000
B = 1.000
C = 0
X = V

AIN:W

A = 1.000
B = 1.000
C = 0
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

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

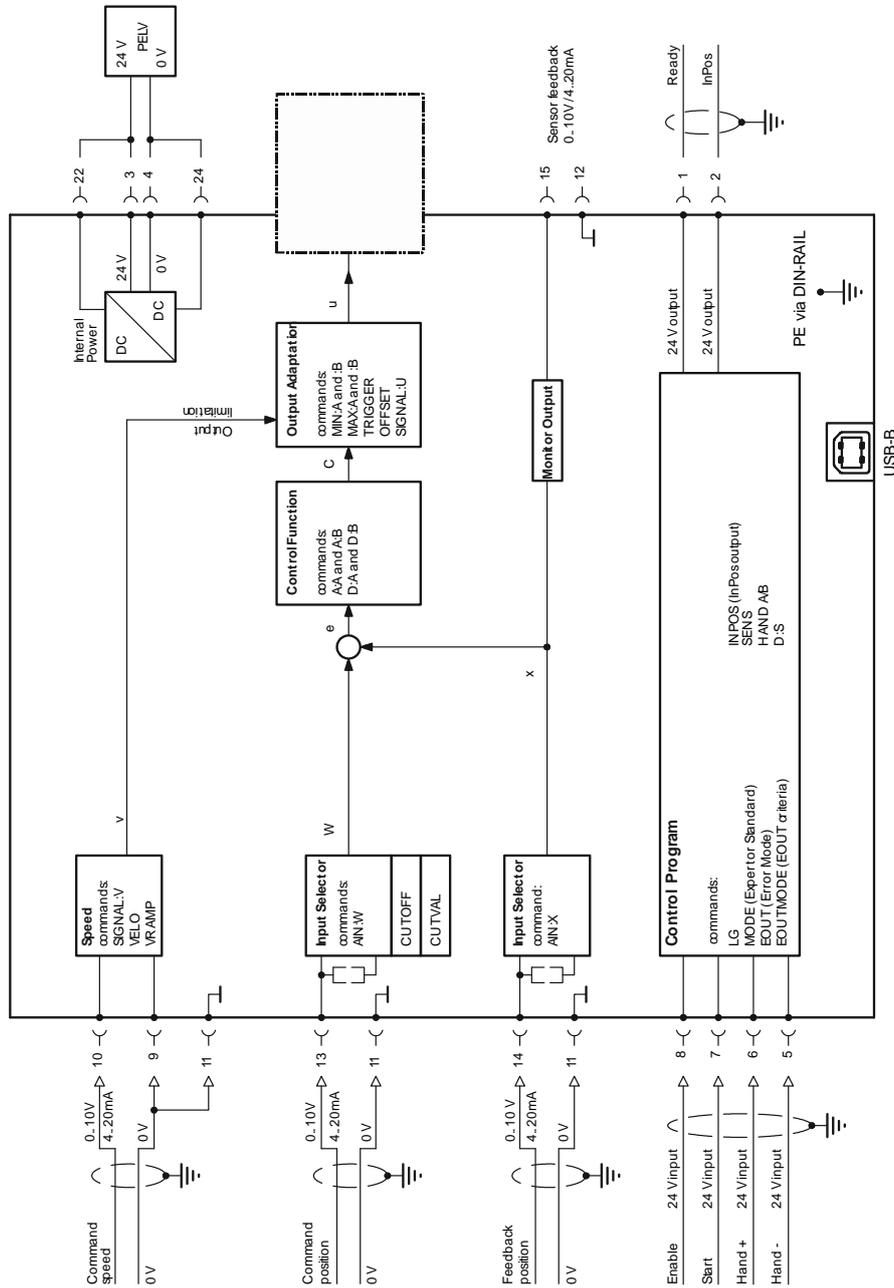
AIN:W

A = 1.111
B = 1.000
C = 500
X = V

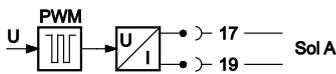
To correctly calculate the values, use the second sheet of the Excel file named 'Input scaling - AIN command.xls' included in the EWMPC software pack. The Excel sheet is simple and intuitive to use.

	A	B	C	D	E	F	G	H
1	Input scaling: current input 4... 20 mA							
2								
3				<i>Factor</i>	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					<i>values to enter</i>			
9	Scaling			1,54	1538	1000	2500	C
10								

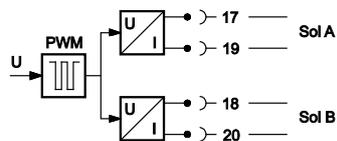
APPENDIX 3: Block Diagram



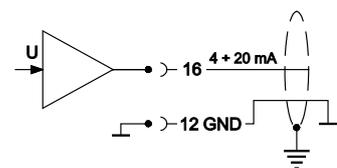
M1 output:



M2 output:



E1 output:



APPENDIX 4: Wiring

