

Manual AP20 Counter



- 8 Digit display in DIN-enclosure 96 X 48 mm
- Supply voltage 10 – 35V DC
- All in- and outputs optically isolated
- Input for incremental encoders
- RS232
- 2 Digital inputs and 4 digital outputs
- 12 Programmable cams / 4 outputs
- 24 Programmable nominal values
- 12 Programmable Cams over 4 outputs (cycle time 250µS)
- Programmable analog output (16 bit) (with teach function)
- Programmable Linearization function

Table of contents

| | | |
|----------|--|-----------|
| 1 | Introduction | 5 |
| 1.1 | GENERAL | 5 |
| 1.2 | IMPORTANT INFORMATION | 6 |
| 1.3 | EMC | 6 |
| 1.4 | DEFINITIONS | 6 |
| 1.4.1 | <i>Display units AWE</i> | 6 |
| 1.4.2 | <i>Parameter number</i> | 6 |
| 1.4.3 | <i>Notation</i> | 7 |
| 1.4.4 | <i>Edges</i> | 7 |
| 2 | Operation | 8 |
| 2.1 | KEY FUNCTIONS | 8 |
| 2.2 | KEY FUNCTIONS IN PROGRAMMING MODE | 9 |
| 2.3 | DISPLAY FUNCTIONS | 10 |
| 2.3.1 | <i>Status functions</i> | 10 |
| 2.3.2 | <i>Error messages</i> | 10 |
| 2.3.3 | <i>Survey of error messages</i> | 11 |
| 3 | Programming | 12 |
| 3.1 | AUTOMATIC MODE | 12 |
| 3.1.1 | <i>Monitor function</i> | 13 |
| 3.1.2 | <i>Displaying the type number</i> | 14 |
| 3.1.3 | <i>Displaying the software-version</i> | 14 |
| 3.1.4 | <i>Status in- and outputs</i> | 15 |
| 3.2 | CHANGING NOMINAL VALUES | 16 |
| 3.3 | CHANGING PARAMETERS | 17 |
| 3.3.1 | <i>Menus</i> | 17 |
| 3.3.2 | <i>Input parameters</i> | 18 |
| 4 | Functions | 19 |
| 4.1 | ACTUAL POSITION | 19 |
| 4.2 | VELOCITY MEASUREMENT | 19 |
| 4.3 | MULTIPLICATOR | 20 |
| 4.4 | POWER FAILURE PROTECTION | 20 |
| 4.5 | EDGE MULTIPLICATION (COUNTER INPUT) | 21 |
| 4.6 | PRESET | 22 |
| 4.6.1 | <i>Preset using input 1 or 2</i> | 22 |
| 4.6.2 | <i>Preset using service parameter P[207]</i> | 22 |
| 4.6.3 | <i>Preset using front keys</i> | 23 |
| 4.7 | COUNTING RANGE (COUNTER INPUT AND INTERNAL FREQUENCY) | 23 |
| 4.7.1 | <i>Set counting range by parameter "Counting range" P[004]</i> | 23 |
| 4.7.2 | <i>Set counting range by nominal value</i> | 24 |
| 4.8 | ASCII PROTOCOL | 25 |
| 4.8.1 | <i>Overview functions</i> | 25 |
| 4.8.2 | <i>General</i> | 26 |
| 4.8.3 | <i>Functions</i> | 28 |
| 4.8.4 | <i>Error messages</i> | 33 |
| 4.9 | ANALOG OUTPUT | 34 |
| 4.9.1 | <i>Voltage output</i> | 34 |
| 4.9.2 | <i>Current output</i> | 35 |

| | | |
|----------|--|-----------|
| 4.9.3 | <i>Example programming voltage output</i> | 36 |
| 4.10 | TEACH FUNCTION ANALOG OUTPUT..... | 36 |
| 4.11 | CAMS..... | 37 |
| 4.11.1 | <i>General</i> | 37 |
| 4.11.2 | <i>Switching type (1) Cam with start- and end-value</i> | 38 |
| 4.11.3 | <i>Switching type (2) Greater than or equal to limit value</i> | 38 |
| 4.11.4 | <i>Switching type (3) Smaller than or equal to limit value</i> | 38 |
| 4.11.5 | <i>Switching type (4) Greater than or equal to limit value (Timer)</i> | 39 |
| 4.11.6 | <i>Switching type (5) Smaller than or equal to limit value (Timer)</i> | 39 |
| 4.11.7 | <i>Dynamic cams</i> | 40 |
| 4.11.8 | <i>Start/stop cam</i> | 41 |
| 4.11.9 | <i>Output "Cams active"</i> | 41 |
| 4.12 | LINEARIZATION | 42 |
| 4.12.1 | <i>mode 0 "4-Quadrant"</i> | 43 |
| 4.12.2 | <i>mode 1 "Mirror Y-axis"</i> | 44 |
| 4.12.3 | <i>mode 2 "Mirror XY-axis"</i> | 44 |
| 5 | Parameters | 45 |
| 5.1 | MENU 1 CONFIG | 45 |
| 5.2 | MENU 2 ACTUAL | 47 |
| 5.3 | MENU 3 SERIAL | 48 |
| 5.4 | MENU 4 INPUT | 49 |
| 5.5 | MENU 5 OUTPUT..... | 50 |
| 5.5.1 | <i>Submenu 5.1 – 5.4 Op1...4</i> | 50 |
| 5.6 | MENU 6 CAM..... | 51 |
| 5.6.1 | <i>Submenu 6.1 ... 6.12 CA1...12</i> | 51 |
| 5.7 | MENU 7 ANALOG OUTPUT | 52 |
| 5.7.1 | <i>Submenu 7.1 Config</i> | 52 |
| 5.7.2 | <i>Submenu 7.2 DA-U (voltage)</i> | 52 |
| 5.7.3 | <i>Submenu 7.3 DA-I (current)</i> | 53 |
| 5.8 | MENU 8 LINEARIZATION..... | 54 |
| 5.8.1 | <i>Submenu 8.1 Config</i> | 54 |
| 5.8.2 | <i>Submenu 11.2 ... 11.31 P1...P30</i> | 55 |
| 5.9 | OVERVIEW PARAMETERS..... | 56 |
| 6 | Connections | 58 |
| 6.1 | OVERVIEW CLAMP CONNECTIONS..... | 58 |
| 6.2 | SUPPLY..... | 59 |
| 6.3 | COUNTING INPUT..... | 60 |
| 6.4 | ENCODER 5V WITH INVERTED SIGNALS | 60 |
| 6.5 | ENCODER 5V WITHOUT INVERTED SIGNALS..... | 61 |
| 6.6 | ENCODER 10 – 30V..... | 61 |
| 6.7 | DIGITAL INPUTS..... | 62 |
| 6.8 | DIGITAL OUTPUTS..... | 62 |
| 6.9 | RS232 | 63 |
| 6.10 | ANALOG OUTPUT..... | 63 |
| 7 | Technical specifications | 64 |
| 7.1 | SPECIFICATIONS | 64 |
| 7.2 | TYPEKEY | 66 |
| 7.3 | DIMENSIONS AP20..... | 67 |
| 7.4 | DIMENSIONS EMC BRACKET TYPE EMC-B02..... | 68 |

| | | |
|-------|--|----|
| 7.4.1 | <i>Connections RS232 on 9P sub-D connector</i> | 69 |
| 7.5 | DIMENSIONS PROTECTIVE HOOD TYPE CDS-B02..... | 70 |

1 Introduction

1.1 General

With the microcontroller based AP20 it is possible to connect the following encoder types:

- Incremental with quadrature (two 90°) signals
- Incremental with pulssignal and directionsignal

It is standard equipped with 2 digital inputs and 4 digital outputs, all free programmable. The AP20 features a RS232 communication port and a analog output.

With the 12 programmable cams several functions can be realized like limit detection.

Another feature of the AP20 is the memory for the nominal values. The 24 programmable values can be used to determine the positions of the cams.

The microcontroller reads the actual sensor value and calculates the display-value and the actual velocity. A programmable power failure protection makes sure that the actual value is stored in an EEPROM. The AP20 is configurable for numerous applications by adjusting its parameters.

The AP20 can be programmed with the DST2 PC-based software.

1.2 Important information

- ✓ The AP20 is a high-tech electronic product. To ensure safety and a correct functioning of the product it is important that only qualified specialists will install and operate the AP20.
- ✓ If through a failure or fault of the AP20 an endangering of persons or damage to plant is possible, this must be prevented using additional safety measures. These must remain operational in all possible modes of the AP20.
- ✓ Necessary repairs to the AP20 are only to be carried out by the manufacturer.

1.3 EMC

To ensure the best possible electromagnetic compatibility, it is recommended to pay attention to shielding and grounding the AP20:

- ✓ Shielding on both sides and with the largest possible contact area.
- ✓ Keep wiring as short as possible.
- ✓ Earth-connections should be short and with the highest possible wiring-diameter.
- ✓ Signal-cables and supply-cables must be separated.
- ✓ The EMC-bracket type EMC-B02 should be used.

1.4 Definitions

1.4.1 Display units AWE

The display units, referred to as AWE, is the value shown on the display without regarding the decimal point. The decimal point is only used for the comfort of the operator, but has no functional meaning.
(display = 347.4 >> AWE = 3474)

1.4.2 Parameter number

A parameter number is always shown in the format P[xxx]. It is possible that a parameter number appears in more than one menu.

1.4.3 Notation

Values can be displayed in different notations like binary or hexadecimal. The character behind the value shows in which notation the value is represented:

| | |
|-----------|---------------------|
| 100D | <u>D</u> ecimal |
| 238H | <u>H</u> exadecimal |
| 244G | <u>G</u> ray |
| 10010011B | <u>B</u> inary |

for example 220D = DCH = 11011100B

1.4.4 Edges

L→H : rising edge (low to high)
H →L : falling edge (high to low)

2 Operation

2.1 Key functions



[P] key

- Cycle through monitoring displays
- Activate programming mode (in combination with other keys)



[+1] key

- View type number



[Cursor] key

- View software version
- View custom software version (in combination with the [Enter] key)



[Enter] key

- View status of inputs and outputs

2.2 Key functions in programming mode



[P] key

- one step back in menu
- discontinue programming mode
- discontinue changing nominal values/parameters (edit mode)
- LED is on when programming mode is active



[+1] key

- cycle through menu
- increase nominal value- / parameter number
- increase digit (in edit mode)



[Cursor] key

- activate edit mode
- move one digit to the left (in edit mode)

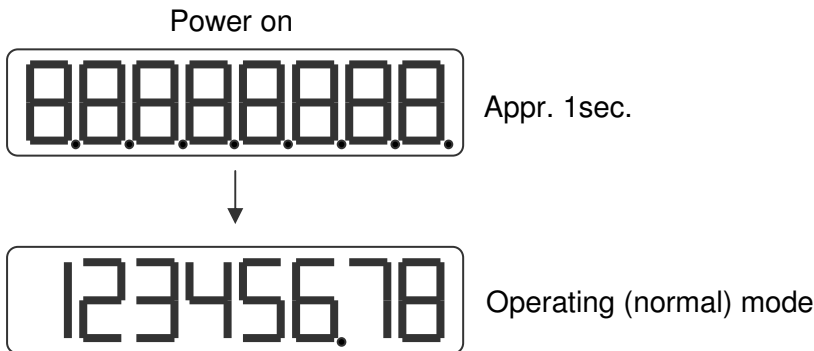


[Enter] key

- enter a submenu or parameter
- increase nominal value-/parameter number
- store a changed value
- clear value, hold down [Cursor] button (edit mode)

2.3 Display functions

2.3.1 Status functions

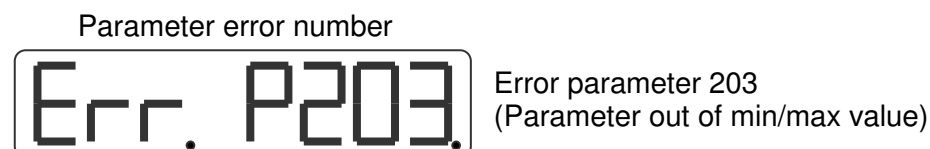


2.3.2 Error messages

There are two groups of errors:

- Parameter errors (error numbers 0...499, preceded by a “P”)
- General error (error numbers from 500 and up)

Example:



2.3.3 Survey of error messages

Error messages:

000...499 Parameter error is displayed as PXXX on the display.

700 = Reference value P[003] \geq Counting range P[004]

716 = Umin \geq Umax (analog output)

717 = Imin \geq Imax (analog output)

720 = Changelock nominal values active

721 = Changelock parameters active

732 = Function input-2 not valid (equal to input-1)

Error messages linearization (xx = P1 ...P30)

9xx = Linearization $X_n \leq X_{n-1}$

940 = Linearization (mode 1 or 2) $X_1 \neq 0$

941 = Linearization mode 1) $Y_1 \neq 0$

Error messages for cams (latst 2 digits = cam number)

1001...1012 length cam = 0 (cam begin = cam end) or
cam begin \leq cam end (with no counting range active)

1101...1112 length cam \leq Hysteresis

1201...1212 (2 * hysteresis) + cam length \geq counting range

1301...1312 cam begin and/or cam end outside counting range
(incl. hysteresis)

1401...1412 hysteresis to large ($>$ half counting range) only with timer
cams

Error messages ASCII

er 1 = parity error

er 2 = frame error

er 3 = overflow error

er 4 = buffer overrun

er 5 = number invalid

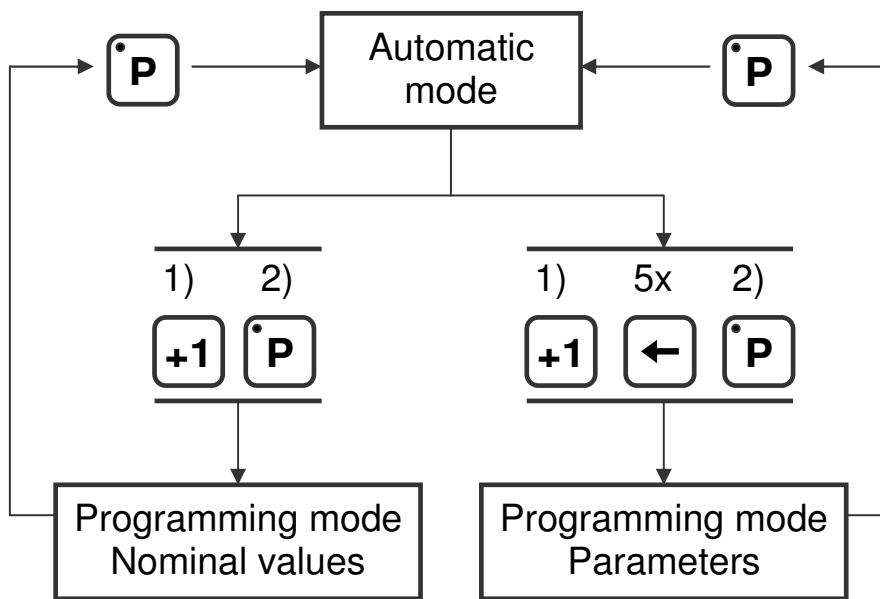
er 6 = data invalid (outside min/max value)

er 7 = programming mode parameters/nominal values active

3 Programming

There are three different modes of operation:

- Automatic mode
- Programming mode for nominal values
- Programming mode for parameters



- 1) hold
- 2) press once

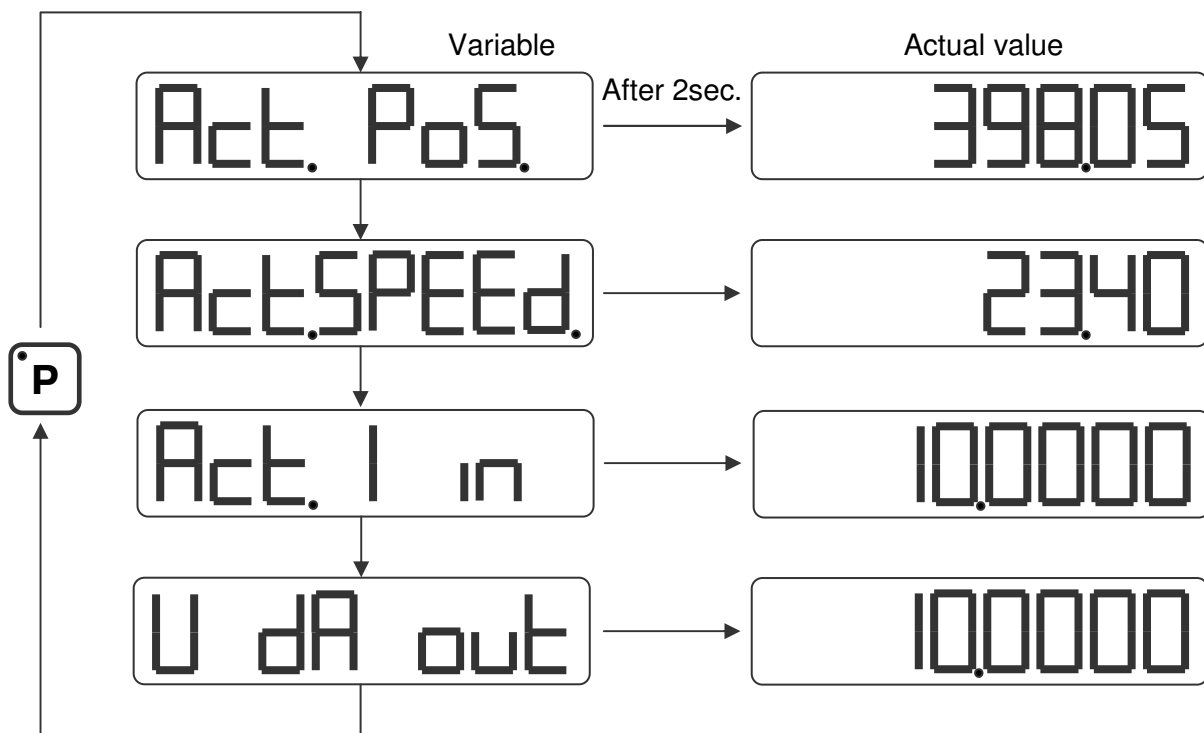
3.1 Automatic mode

In the automatic mode, depending on the type of sensor, the increments are counted or the absolute position is read and the result is shown on the display as the actual value. The velocity is calculated and can be visualized as well.

3.1.1 Monitor function

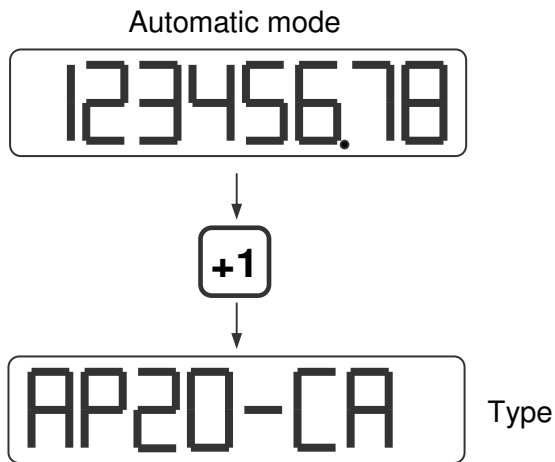
In automatic mode different variables can be displayed. By using the [P] key one can cycle through the different pages:

- Actual position
- Actual velocity
- Actual linearization
- Voltage or current of the DA (analog out)

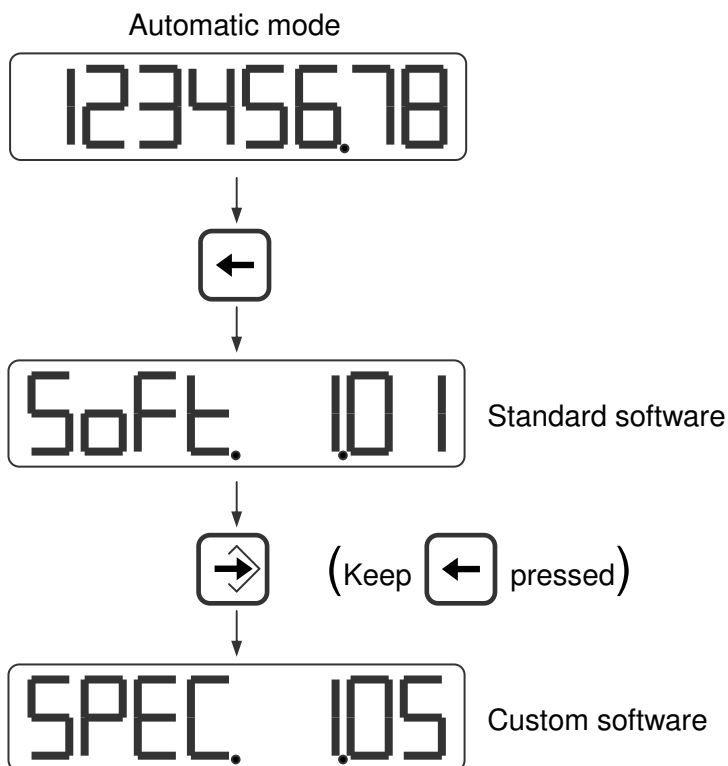


Parameter P[208] determines which option is visible after start-up.

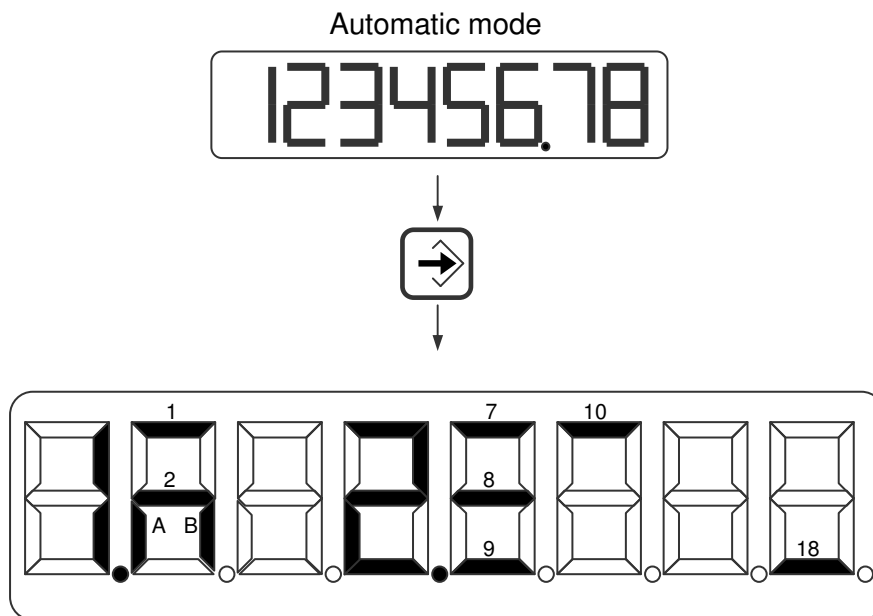
3.1.2 *Displaying the type number*



3.1.3 *Displaying the software-version*



3.1.4 Status in- and outputs



Inputs

1 = input-1
2 = input-2
A = input K1
B = input K2

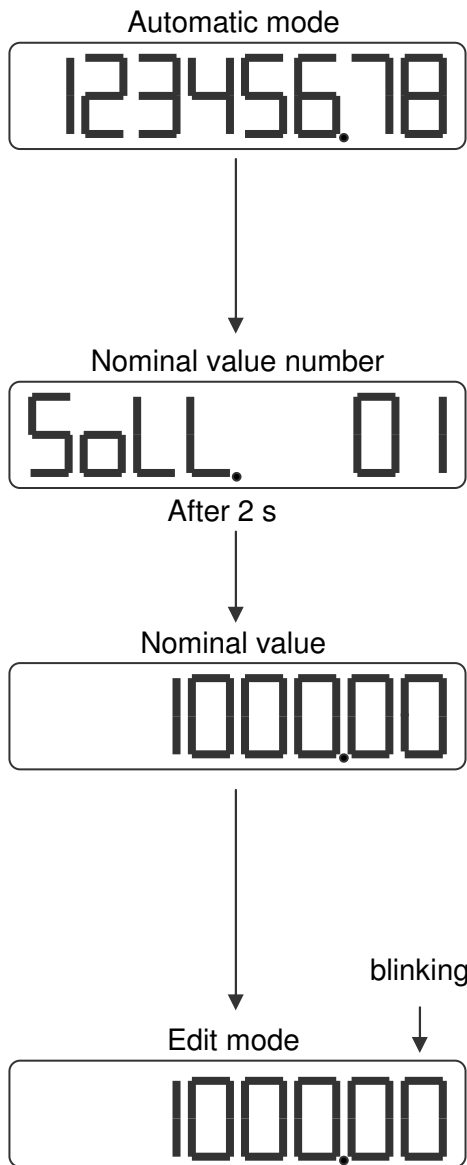
Outputs

7 = output-1
8 = output -2
9 = output -3
10 = output -4

Outputs

18 = Cams active

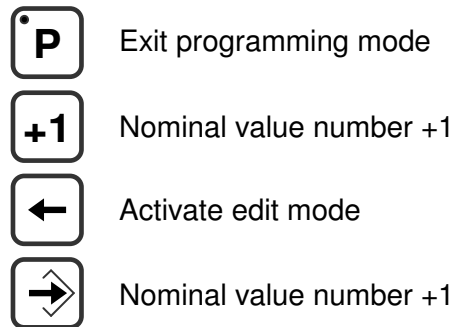
3.2 Changing nominal values



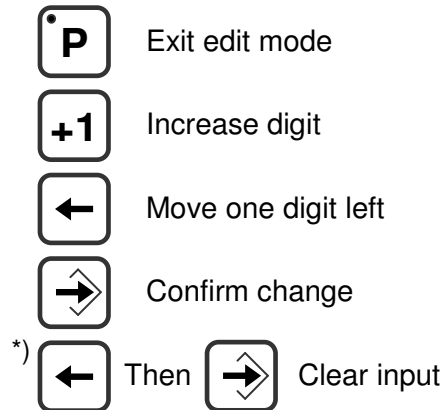
Access to nominal values



Select nominal values



Changing values



*) keep pressed

3.3 Changing parameters

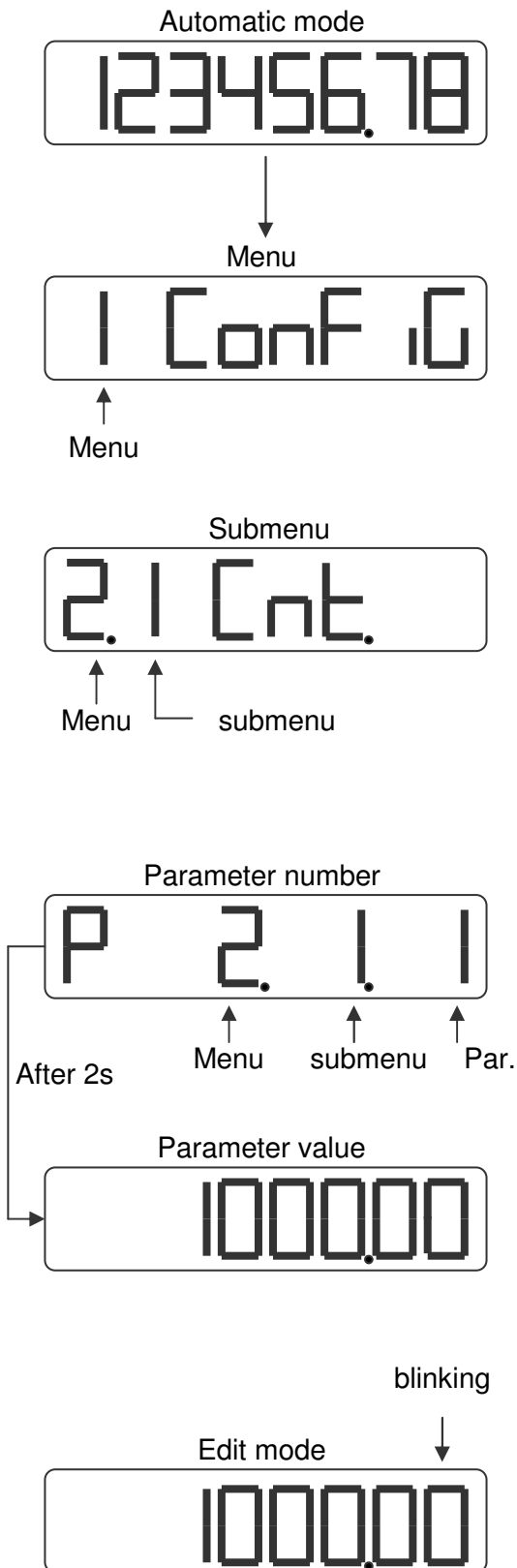
3.3.1 Menus

The parameters are displayed in different menus and submenus:

```
1 ConFiG
2 ActuAL
3 SEriAL
4 InPut
5 OutPut
  5.1 OP1
  ... ..
  ... ..
  5.4 OP4
6 Cam
  6.1 CA1
  ... ..
  ... ..
  6.12 CA12
7 An out
  7.1 ConFG.
  7.2 dA-U
  7.3 dA-I
8 Lin
  8.1 ConFG.
  8.2 P 1
  ... ..
  ... ..
  8.31 P30
```

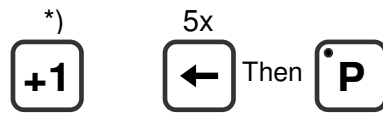
Example:
PAr. 6.1.1 is
menu 6, submenu 1, parameter 1

3.3.2 Input parameters

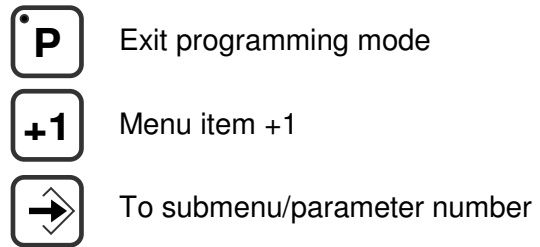


*) keep pressed down

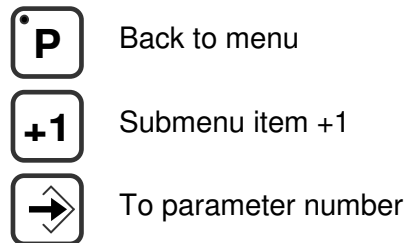
Access parameters



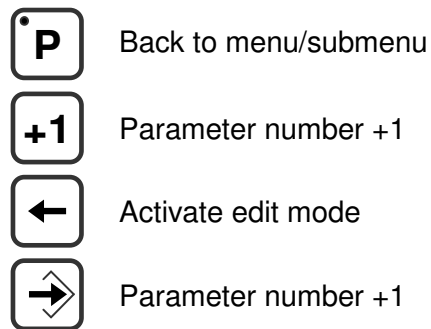
Menu selection



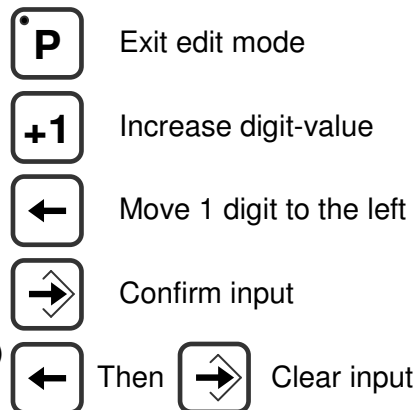
Submenu selection



Selecting parameters



Changing parameters



4 Functions

4.1 Actual position

The actual position shown on the display.

$$\text{Actual position} = \text{Counter} \times \text{FL} \times \text{dir} \times \frac{\text{Mt}}{\text{Mn}}$$

| | | | |
|-----|---|---------------------------|--------|
| FL | = | edgemultiplier | P[210] |
| Mt | = | multiplicator numerator | P[000] |
| Mn | = | multiplicator denominator | P[001] |
| dir | = | direction (x1 or x -1) | P[211] |

4.2 Velocity measurement

The velocity measurement is always active and delivers the actual speed in AWE/s.

Two parameters are necessary to configure the measurement:

P[088] = measuring time [AWE/s]

The smaller the measurement time the more dynamic the velocity measurement will be. This time is also the refreshment-interval on the display.

P[202] = integrator

The number of cycles are programmed. The average velocity (unit =AWE/s) of the programmed cycles is calculated.

Example:

Measurement time = 50ms, integrator = 10.

The actual velocity will be refreshed every 50 ms and is the average velocity during the last 10 measurements.

4.3 Multiplier

By using the multiplier it is possible to convert the counter-value to display-units (AWE).

Example:

Encoder with 90° shifted signal and 1024 increments/revolution will have 4096 edges/revolution. If the desired value in the display is 360,0 (= 3600 AWE), the multiplier will be $3600/4096 = 0,87890625$.

It is possible to program the exact values (3600 and 4096) instead of the fraction.

Multiplier (numerator) P[000] = 3600

Multiplier (denominator) P[001] = 4096

Through P[203] it is possible to adjust the decimal point.

4.4 Power failure protection

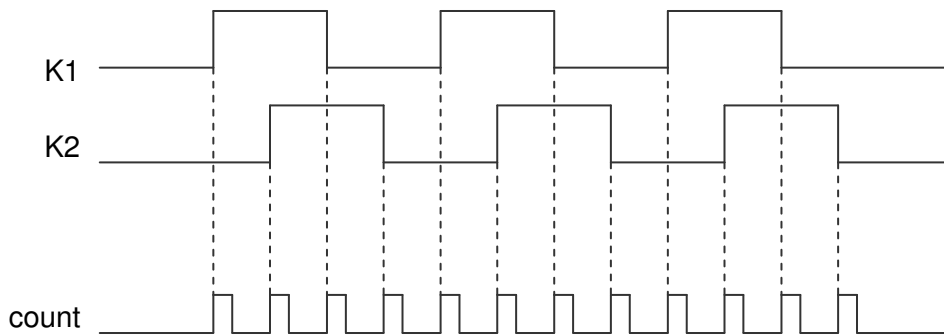
If P[206] = 1 then the actual position of the AP20 will be stored in EEPROM when power is shut down. After power up this value will be restored. When the writing is finished the display shows the following.



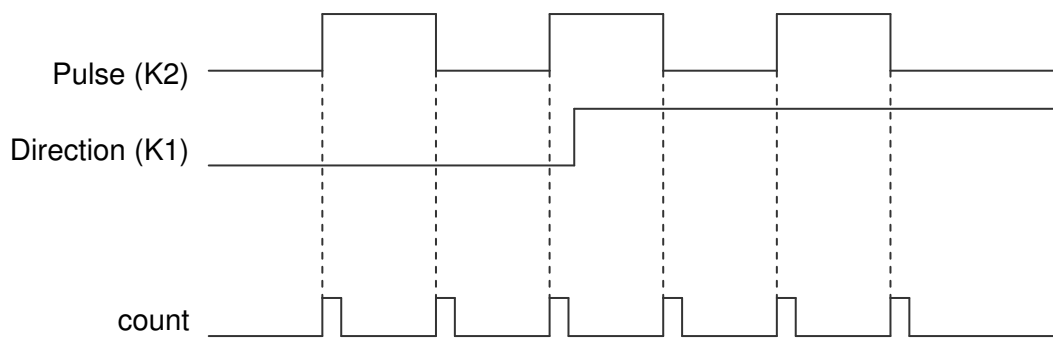
4.5 Edge multiplication (counter input)

There are two possibilities for the counter input:

V-signal x4: edge multiplication x4, 90° shifted encoder signals.



S-signal x2: edge multiplication x2, encoder signal with directional signal.



4.6 Preset

The preset function can be used in 3 ways:

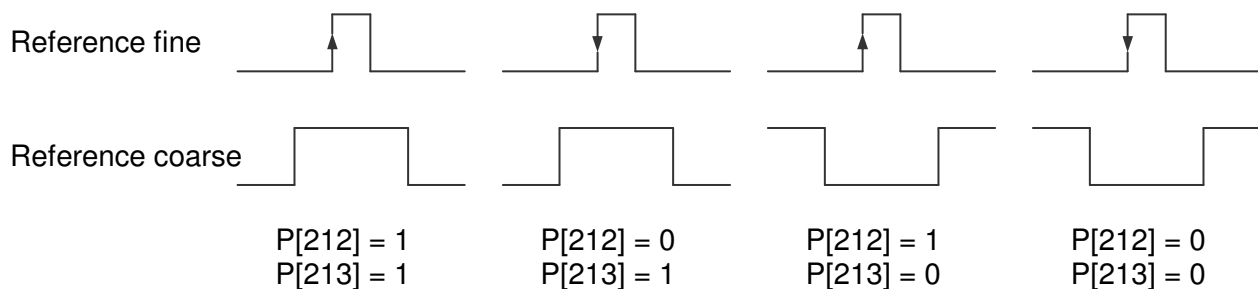
- Using inputs 1 or 2 (in combination with reference coarse)
- Using parameter service functions P[207]
- Using front keys

4.6.1 Preset using input 1 or 2

The function preset is used to set the actual value to a programmed value, stored in P[003].

The value will be set in case of an active edge from the reference fine signal (Input 1 or 2).

If reference coarse has been activated (P[213] \neq 0) one of the inputs has to be programmed to "1 - Reference Coarse".



4.6.2 Preset using service parameter P[207]

When P[207] has the value 111 then the actual position is preset with the value of P[003] when exiting the programming mode. The parameter reference coarse P[213] and direction reference fine P[209] have no function.

After executing this function parameter P[207] will have the value 0 again.

4.6.3 Preset using front keys

The function preset can be executed with the key combination [Enter] + [P]. Holding down the [Enter] key and push the [P] key one time. Then the actual position is preset with the value of P[003]. The parameter referene coarse P[213] and direction reference fine P[209] have no function.

This function is active when: P[212] = variant "3 front keys"

4.7 Counting range (counter input and internal frequency)

The counting range used by the counter can be limited when using the counter input or the internal frequency (P[201] = 0 or 2). The counting range can be set either by parameter or nominal value.

4.7.1 Set counting range by parameter "Counting range" P[004]

If P[233] = variant "0 parameter counting range" the increments for the counting range can be programmed in parameter P[004], ignoring the decimal point. If P[004] = 0 the counting range is deactivated.

$$\text{Counting range P[004]} = \frac{\text{Display range (AWE)} * \text{Mul (nominator) P[001]}}{\text{Mul (denominator) P[000]}}$$

The number of increments is programmed, ignoring the decimal point.

Counting range P[004]

0 = function not active

1 ... counting range

Example:

*Incremental encoder, 90° shifted signals, 1000 pulses/rev. and 1,5 rev.
= 360,0 degrees.*

*1000 pulses/rev. is equal to 4000 increments/rev. (edge multiplication
x4).*

3600 AWE ⇔ 1,5 x 4000 = 6000 increments

Multiplicator (numerator) P[000] = 3600

Multiplicator (denominator) P[001] = 6000

Counting range P[004] = 6000 increments

At P[203] it is possible to program the use of a decimal point.

Display will show:

4.7.2 Set counting range by nominal value

If P[233] = variant "**x Nominal value x**" the increments in AWE for the counting range can be programmed by the selected nominal value. In this case P[004] is internally calculated. If the selected nominal value = 0 the counting range is deactivated

4.8 ASCII protocol

The serial port of the AP20 is able to work with an ASCII protocol.

Using the ASCII protocol, actual values can be read, parameters and nominal values can be stored and read, the status of the digital inputs and outputs can be monitored etc.

4.8.1 Overview functions

| | |
|-----------|---|
| sc | select AP20 |
| r0 | Read actual position (AWE) |
| r1 | Read actual velocity (AWE/s) |
| r2 | Read actual voltage analog output (0,1mV units) |
| r3 | Read actual current analog output (0,1 mA units) |
| r8 | Lezen actuele linearization (AWE) |
| ri | Read status inputs |
| ru | Read status outputs |
| rk | Read status input K1 en K2 |
| wu | Write outputs |
| rp | Read parameter |
| wp | Write parameter (Only EEPROM) |
| rs | Read nominal value |
| ws | Write nominal value (RAM + EEPROM) |
| rx | Read software version |
| rt | Read type number |
| rh | Read hardware version |
| rf | Read error number |
| rn | Read status bits |
| bp | Load and activate |

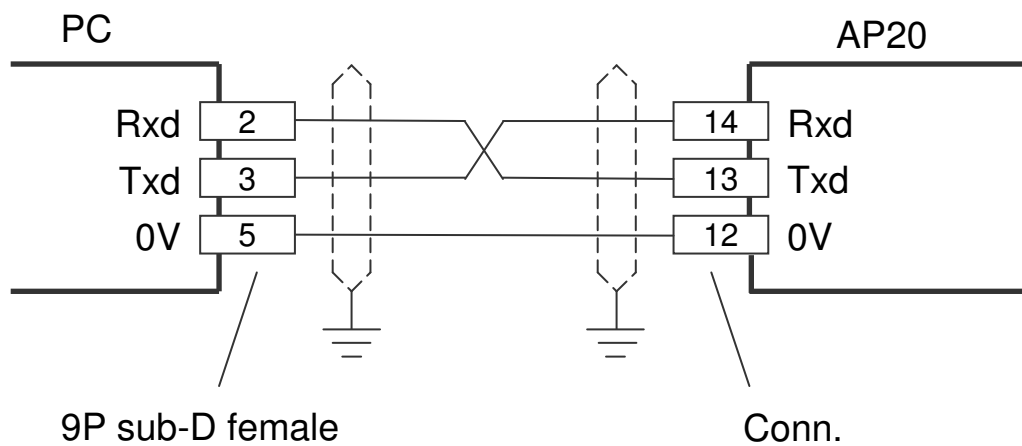
4.8.2 General

Through the ASCII protocol it is possible to communicate with the AP20.

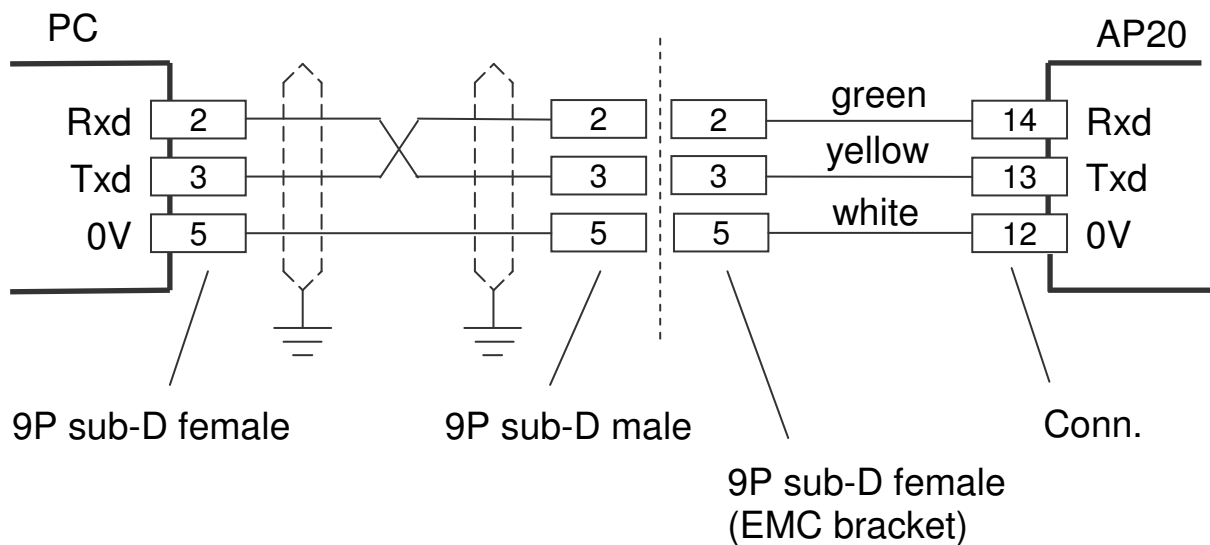
Send: Data from PC, PLC → AP20

Receive: Data from AP20 → PC, PLC

Connection without EMC bracket



Connection with EMC bracket (EMC-B02)



Send structure:

Functioncode (space) [argument 1](space)[argument 2] <CR>

Receive structure:

Functioncode (space) [argument1](space)[argument 2] <CR> <LF>

Functioncode (space) [argument1] [argument 2].

Argument 1 and 2 are depending on the function and are separated by a space.

Example:

***wp 20 250** (write value 250 to parameter 20)*

4.8.3 Functions

sc Select AP20

send: **sc xx**
receive: **sc xx**
transmitting parameter: Unit Id number

The AP20 with the unit Id number is selected, all consecutive commands are relevant for this unit.

An AP20 with unit Id number 0 will always respond.

r0 Read actual position (AWE)

send: **r0**
receive: **r0 xxxxxxxx**
transmitting parameter: none

r1 Read actual velocity (AWE/s)

send: **r1**
receive: **r1 xxxxxxxx**
transmitting parameter: none

r2 Read actual voltage analog output (0,1mV units)

send: **r2**
receive: **r2 xxxxxxxx**
transmitting parameter: none

r3 Read actual current analog output (0,1 mA units)

send: **r3**
receive: **r3 xxxxxxxx**
transmitting parameter: none

r8 Lezen actuele linearization (AWE)

zenden: **r8**
ontvangen: **r8 xxxxxxxx**
overgaveparameter: geen

ri Read status inputs

send: **ri**
receive: **ri xxx**
transmitting parameter: none

B0 = input-1
B1 = input-2
B2 = 0
B3 = 0
B4 = 0
B5 = 0
B6 = 0
B7 = 0

Example: ri 03 gives the following answer:

*03 → 03H, 0000 0011 B
input-1 = "1"
input-2 = "1"*

ru Read status outputs

send: **ru**
receive: **ru xxx**
transmitting parameter: none

B0 = output-1
B1 = output-2
B2 = output-3
B3 = output-4

rk Read status input K1 and K2

send: **rk**
receive: **rk x**
transmitting parameter: none

B0 = K1 or counting direction
B1 = K2 or counting pulse

wu Write outputs

(only valid for outputs with "ASCII protocol" selected)

send: **wu xxx**
receive: **wu xxx**
transmitting parameter: data for output

B0 = output-1
B1 = output-2

Example:
Output-2 should be set to "1":
00000010B = 02H = 02D
send: wu 10
receive: wu 10

rp Read parameter

send: **rp xxx**
receive: **rp xxxxxxxx**
transmitting parameter : parameter number

Example reading parameter P[004]
send: rp 4
answer: rp 4 10000

wp write parameter (only EEPROM)

send: **wp xxx xxxxxxxx**
receive: **wp xxx xxxxxxxx**

transmitting parameter: parameter number and parameter value

Example writing parameter P[004] with value 185000

send: wp 4 185000

answer: wp 4 185000

Parameter will be stored to EEPROM but is not yet active.

rs Read nominal value

send: rs xx

receive: rs xx xxxxxxxx

transmitting parameter: nominal value

Example reading nominal value 22

send: rs 22

answer: rs 22 72500

ws Write nominal value (RAM + EEPROM)

send: ws xx xxxxxxxx

receive: ws xx xxxxxxxx

transmitting parameter: nominal value number and nominal value

Example writing nominal value 22 with value 195200

send: wp 22 195200

answer: wp 22 195200

rx Read software version

send: rx

receive: rx SW Vxx.xx SSW xx.xx

transmitting parameter: none

SW = standard software version

SSW = special software version

Example:

send: rx

answer: rx SW 4.02 SSW 1.00

rt Read type number

send: **rt**
receive: **rt AP20-DA**
transmitting parameter: none

Example:

send: rt
answer: rt AP20-DA

rh Read hardware version

send: **rh**
receive: **rh HW x RV x**
transmitting parameter: none

rf Read error number

send: **rf**
receive: **rf xxxx**
transmitting parameter: none

When -1 returns no error is present.

Example:

send: rf
answer: rf 004 (parameter error)
or
answer: rf -1 (no error)

rn Read status bits

send: **rn**
receive: **rn xxx**
transmitting parameter: none

B0 = cams active (started)
B1 = reference set

bp Load and activate

send: **bp**
receive: **bp xxx**
transmitting parameter: none

In case of an error the error number will be returned (-1 is no errors).

*Example: answer: bp -1 (no errors)
 answer: bp 20 (error parameter 20)*

4.8.4 Error messages

In case of an error the AP20 will send an error message followed by an error number.

overview error messages

- er 1** = parity error
- er 2** = frame error
- er 3** = overflow error
- er 4** = buffer overrun
- er 5** = number invalid
- er 6** = data invalid (for example outside min/max range)
- er 7** = programming mode parameters/nominal values still active
- er 8** = function impossible

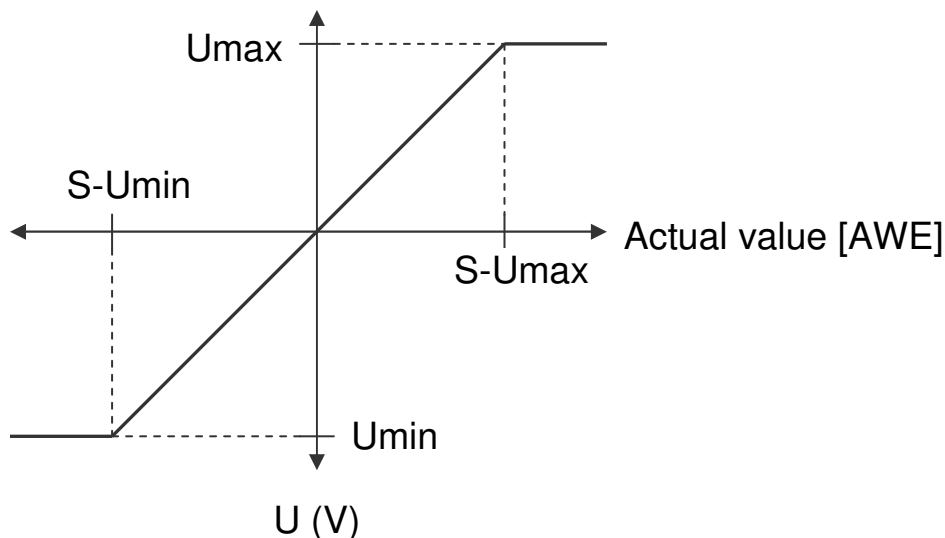
4.9 Analog output

The AP20 has an optional, galvanically isolated analog output. Using parameter P[231] it is possible to choose between a current output or a voltage output. The analog output can be used to give out the actual position, velocity or linearization (see parameter P[230]).

4.9.1 Voltage output

The voltage output has a resolution of $305 \mu\text{V}$ and is programmable through P[080] ... P[083].

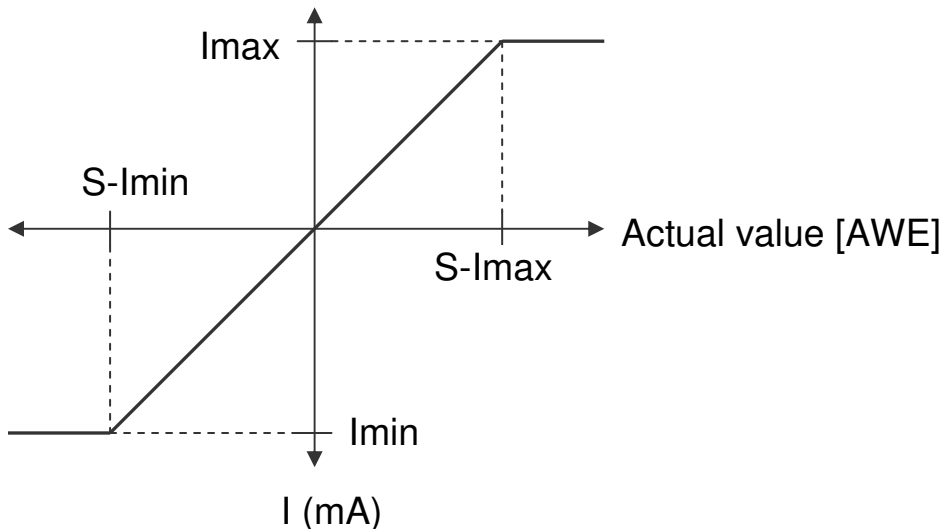
- P[080] = U_{min} [V] (input in 0,0001V units)
- P[081] = U_{max} [V] (input in 0,0001V units)
- P[082] = S- U_{min} [AWE] (actual value at U_{min})
- P[083] = S- U_{max} [AWE] (actual value at U_{max})



4.9.2 Current output

The current output has a resolution of 610 μA and is programmable through P[084] ... P[087].

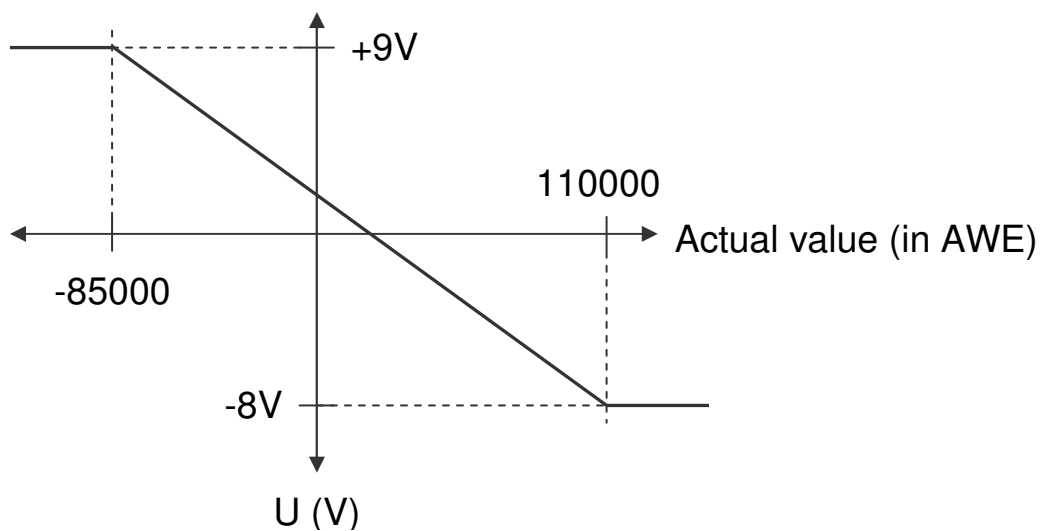
- P[084] = I_{min} [A] (input in 0,0001mA units)
- P[085] = I_{max} [A] (input in 0,0001mA units)
- P[086] = S- I_{min} [AWE] (actual value at I_{min})
- P[087] = S- I_{max} [AWE] (actual value at I_{max})



4.9.3 Example programming voltage output

- > 0,01 mm units
- > actual position at +9V should be -850,00 mm
- > actual position at -8V should be 1100,00 mm

| | | |
|--------|----------|----------------|
| P[080] | = Umin | = -8,0000 [V] |
| P[081] | = Umax | = +9,0000 [V] |
| P[082] | = S-Umin | = 110000 [AWE] |
| P[083] | = S-Umax | = -85000 [AWE] |



4.10 Teach function analog output

The value for S_{min} and S_{max} can be set by an external input signal. For this function parameter P[234] and or P[235] can be set to variant "1 Teach via input". The function for the input 1...4 can be set to variant "11 DAC Set S_{min} " or variant "12 DAC Set S_{max} ".

On the positive edge of the input signal the teach function will be executed. The value of S_{min} or S_{max} will be stored with the actual position or the actual speed depending on parameter P[230]. The display will show "teach Lo" or "teach hi" for a short time.

4.11 Cams

4.11.1 General

The AP20 has a maximum of 12 programmable cams divided over a maximum of 4 outputs. Each with 5 switching types.

Programmable functions:

- Switching type
 1. Cam with start- and end-value
 2. Greater than or equal to limit value
 3. Smaller than or equal to limit value
 4. Greater than or equal to limit value (Timer)
 5. Smaller than or equal to limit value (Timer)
- Source (actual position or actual velocity)
- Nominal value location number for start-, end-, or limit value
- Hysteresis
- Output for cam
- Switching time (only for timer cam Type 4 en 5)

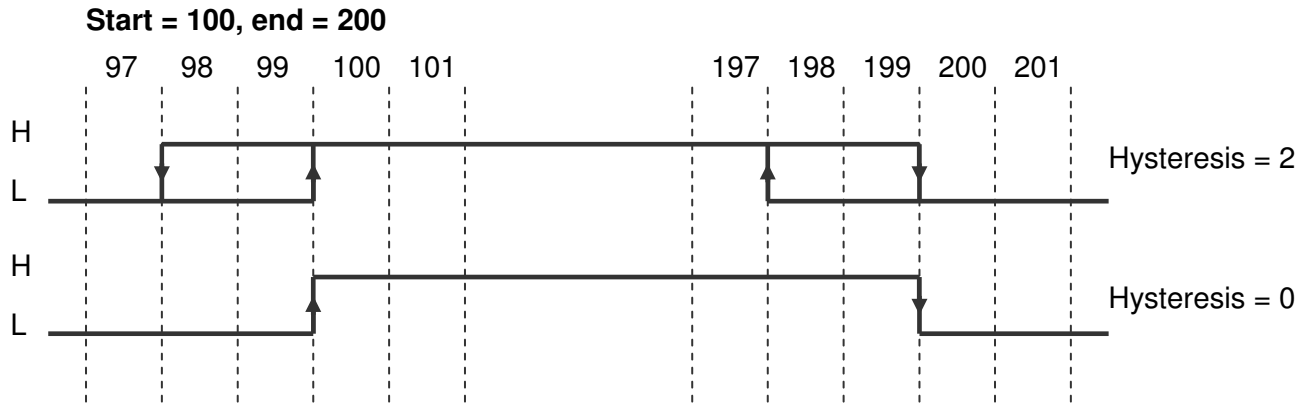
For switching type 1 there is a start- and end value. For Switching type 2...5 there is only a limit value needed.

When selecting switching type 4 and 5 the cam length is depending on the programmed time value in parameter P[120]...P[131].

Per cam one can choose whether to program the values directly into the parameters or to use a nominal value location number where the values are programmed.

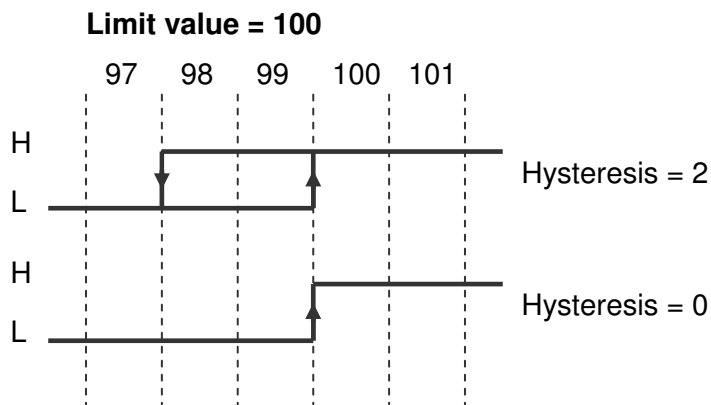
4.11.2 Switching type (1) Cam with start- and end-value

Two values are programmed, a start value and an end-value.



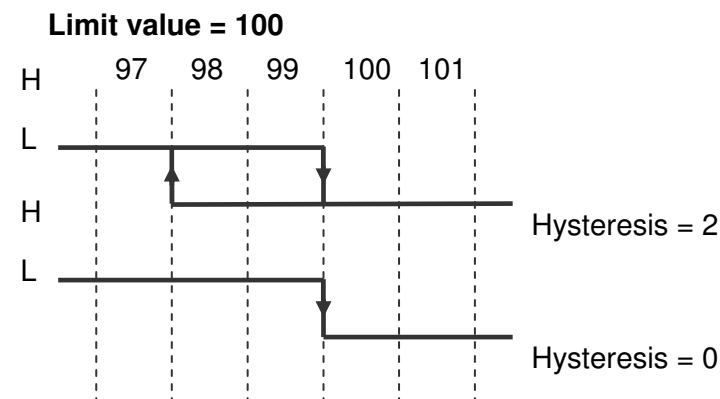
4.11.3 Switching type (2) Greater than or equal to limit value

Only one limit value needs to be programmed.



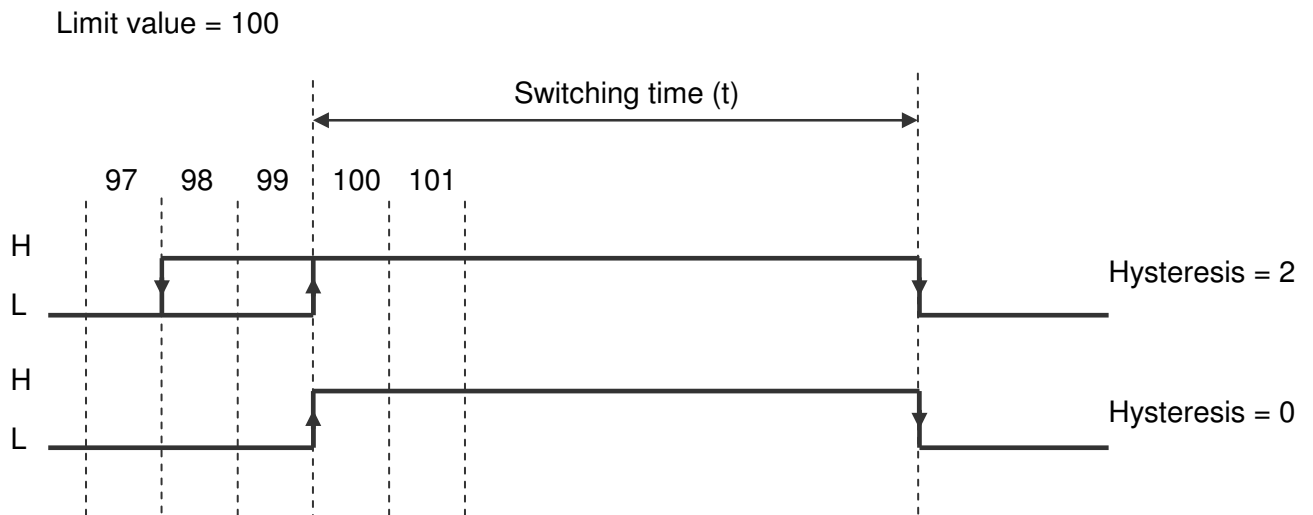
4.11.4 Switching type (3) Smaller than or equal to limit value

Only one limit value needs to be programmed.



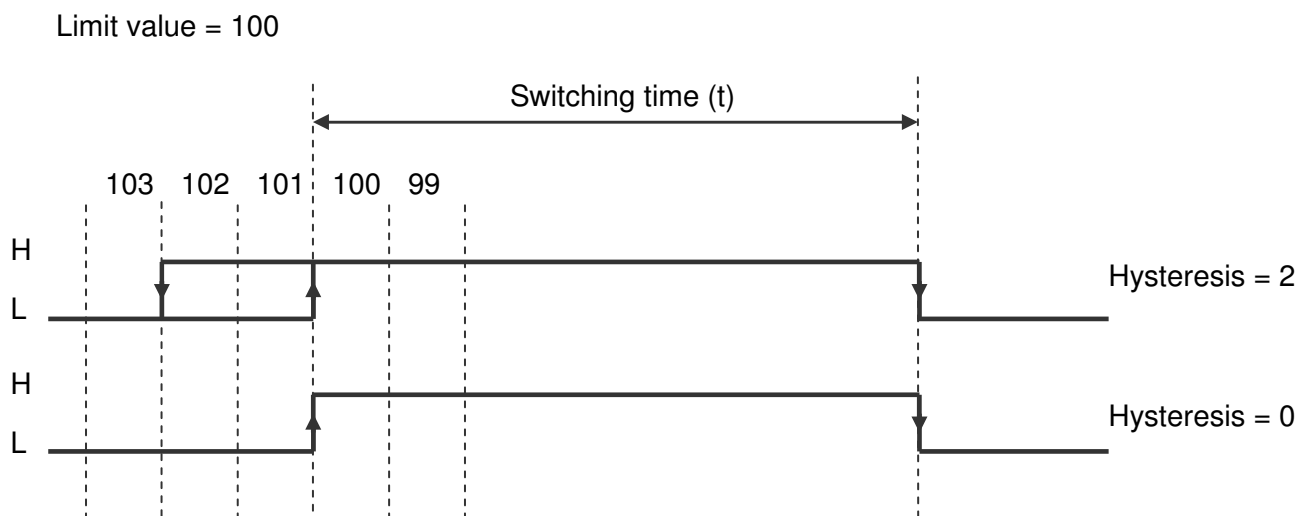
4.11.5 Switching type (4) Greater than or equal to limit value (Timer)

Limit value and switching time need to be programmed. This cam is activated when the actual value is greater than or equal to the limit value (counting upwards) and is a retriggerable timer.



4.11.6 Switching type (5) Smaller than or equal to limit value (Timer)

Limit value and switching time need to be programmed. This cam is activated when the actual value is smaller than or equal to the limit value (counting downwards) and is a retriggerable timer.



4.11.7 Dynamic cams

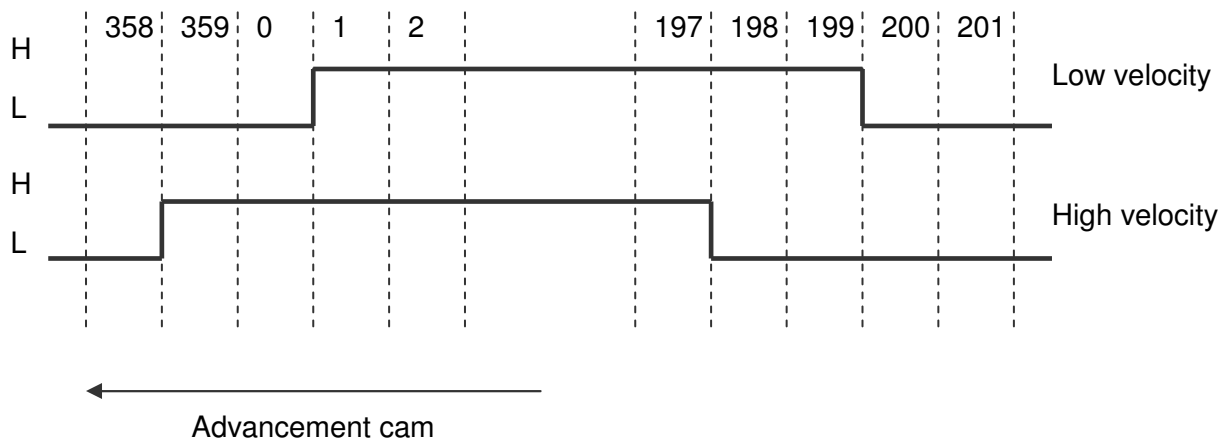
To compensate for actions with a static time, for example the switch time of a valve, it is possible to program a time for each output individually. The cams will be shifted according to this programmed time.

This function is only available for cams with (P[256] ... P[267] = 1, 4 or 5) and when the source of this cam is the actual position (P[280] ... P[291] = 1).

When working with a counting range the possibility of cams shifting over the zero-point is taken into account.

Example:

startvalue: 1
endvalue: 200
hysteresis: 0
counting range display: 360



4.11.8 *Start/stop cam*

The outputs for the cams can be enabled or disabled. If for one of the inputs 1..6 the function start/stop cams has been chosen.

Start/stop cams with one signal

Input-x = option "**5 start/stop cams**" (high = cams enabled)

Start/stop cams with double signal

Input-x = option "**6 start cams**" (rising edge = enable cams)

Input-x = option "**7 stop cams**" (rising edge = disable cams)

4.11.9 *Output "Cams active"*

On one of the outputs 1...4 the signal "cams active" can be generated by choosing option "**4 cams active**" (high = cams enabled).

4.12 Linearization

The linearization function allows to display and process nonlinear motions. The actual display position (sensor) position or actual velocity is converted into an additional value "Actual linearization". This additional value can serve as a source for the cams function and analog output.

Parameter "Source" P[246]

optie "0 Inactive"

optie "1 Actual position"

optie "2 Actual speed"

The linearization function works with a tabel of max. 30 points (P1...P30). Every point has a X (Pn-X) and Y (Pn-Y) value. The X value represents the actual (sensor) position or velocity and the Y value represents the desired actual (sensor) position or velocity called "Actual linearization". Interpolation takes place between these points

Parameter P[247] determines the number of active points and can be programmed with a value of 2 ...30 points. The value of the actual linearization can be displayed in the monitor function. P[248] determines the number of decimals shown.

For linearization 3 modes are available.

Parameter "mode" P[241]

optie "0 4-Quadrant"

optie "1 Mirror Y-axis"

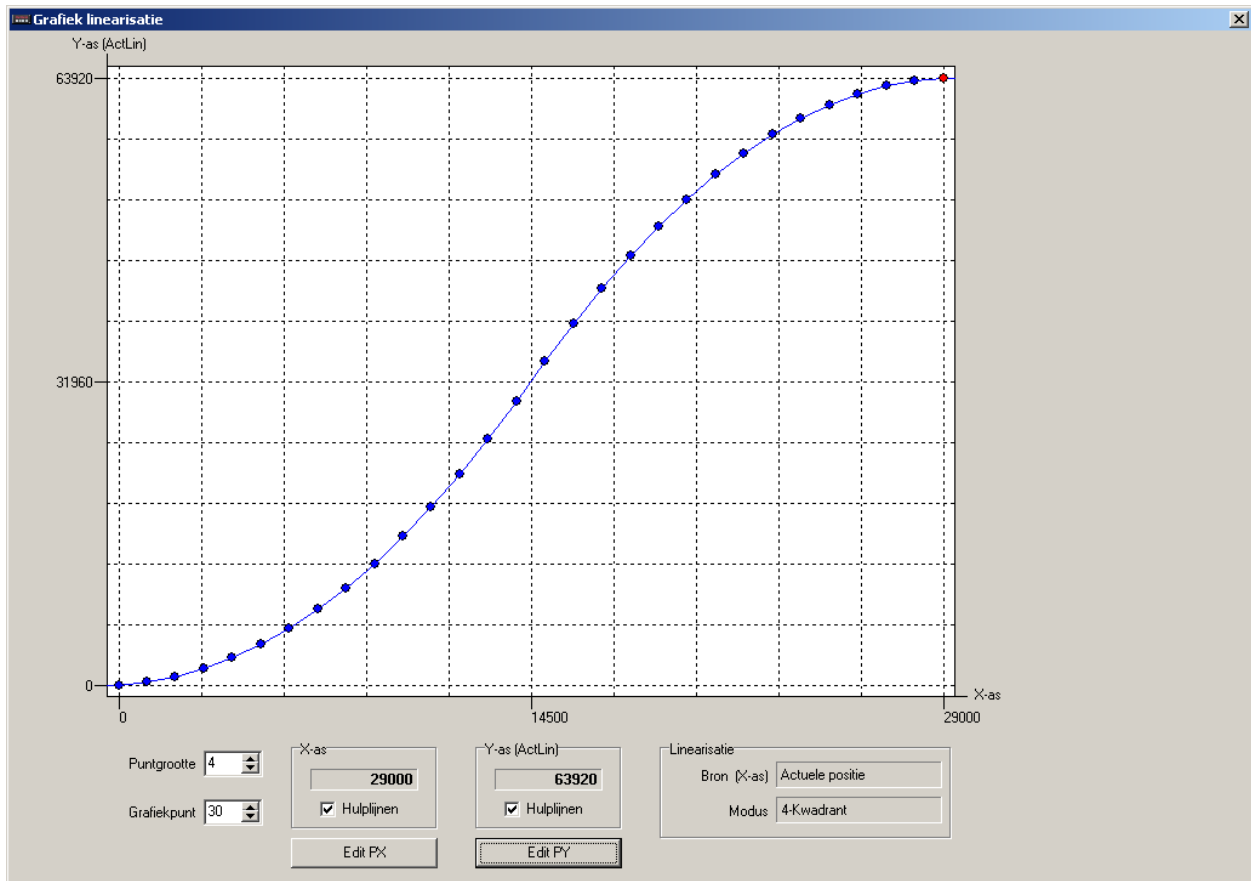
optie "2 Mirror XY-axis"

4.12.1 mode 0 "4-Quadrant"

This is the standard mode which can build every possible curve. Both the X-axis and the Y-axis may contain negative values.

Condition:

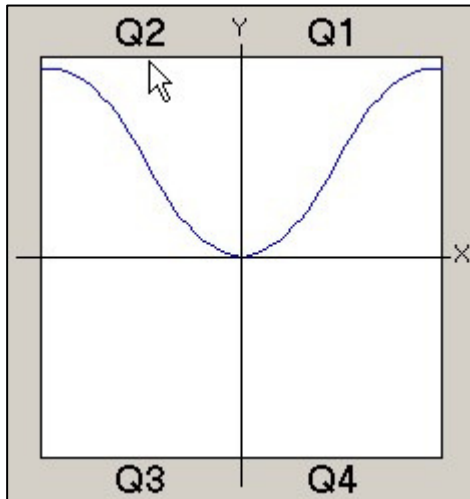
$P1-X < P2-X < P3X < \dots < P30-X$



Screenshot from PC programm DST2

4.12.2 mode 1 “Mirror Y-axis”

In this mode, the entered curve is mirrored and copied over the Y-axis, so that this curve is the same for the negative X-axis values. Q1 is the entered curve.



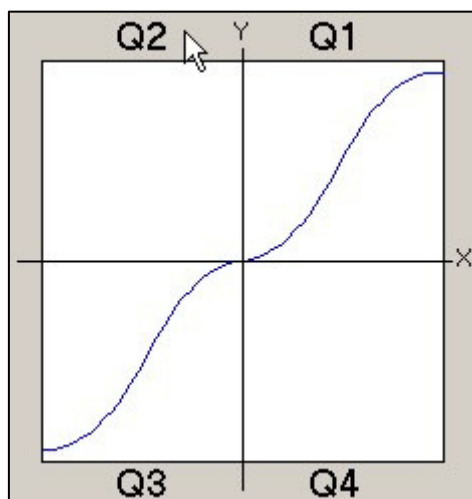
Conditions:

$$P1-X < P2-X < P3X < \dots < P30-X)$$

$$P1-X = 0$$

4.12.3 mode 2 “Mirror XY-axis”

In this mode, the entered curve is mirrored and copied over the X-axis and Y-axis, so that this curve is the same for the negative X-axis and Y-axis values. Q1 is the entered curve.



Conditions:

$$P1-X < P2-X < P3X < \dots < P30-X)$$

$$P1-X = 0$$

$$P1-Y = 0$$

5 Parameters

General lay-out:

| PAR. | PAR Nr: | Possible values (bold is the standard value) |
|--------------------------------|---------|--|
| Basic description | | |
| Description of possible values | | |

5.1 Menu 1 Config

| PAR: 1.0.1 | P[088] | 0 ... 40 ... 2500 |
|---|--------|--------------------------|
| Measuring time velocity [AWE/s] (equal to refreshment time display) | | |
| X.XXX (sec) input 0 .. 1.000s | | |

| PAR: 1.0.2 | P[202] | 0 ... 10 ... 20 |
|--|--------|------------------------|
| Integrator velocity | | |
| Actual velocity is the average from the number of measurements | | |
| 0 = not active | | |
| 1...20 number of measurements | | |

| PAR: 1.0.3 | P[203] | 0 ... 6 |
|--------------------|--------|----------------|
| Number of decimals | | |
| 0 = none | | |
| 1 = X.X | | |
| 2 = X.XX | | |
| 3 = X.XXX | | |
| 4 = X.XXXX | | |
| 5 = X.XXXXX | | |
| 6 = X.XXXXXX | | |

| PAR: 1.0.4 | P[204] | 0 ... 1 |
|-----------------|--------|----------------|
| Store function | | |
| 0 = no function | | |
| 1 = display | | |

| PAR: 1.0.5 | P[205] | 0 ... 2 |
|-----------------|--------|----------------|
| Store signal | | |
| 0 = high active | | |
| 1 = low active | | |

| | | |
|--------------------------|--------|---------|
| PAR: 1.0.6 | P[206] | 0 ... 1 |
| Power failure protection | | |
| 0 = not active | | |
| 1 = active | | |

| | | |
|---|--------|-----------|
| PAR: 1.0.7 | P[207] | 0 ... 123 |
| Service functions | | |
| Only possible to activate through keyboard AP20 | | |
| Value is automatically set to 0 after executing the service function | | |
| 0 = not active | | |
| 123 = set default parameters | | |
| 111 = adjusting absolute sensors or preset function counter and freq. | | |

| | | |
|---|--------|---------|
| PAR: 1.0.8 | P[208] | 0 ... 2 |
| Default monitor function | | |
| Determines the default which is visible after start-up. | | |
| 0 = Actual position | | |
| 1 = Actual velocity | | |
| 2 = Actual linearization | | |

5.2 Menu 2 Actual

| | | |
|--|--------|---------|
| PAR: 2.1.1 | P[210] | 0 ... 1 |
| Signal type and edge multiplication | | |
| "S-signal X2": K2 is counter and K1 is direction | | |
| 0 = V-signal X4 | | |
| 1 = S-signal X2 | | |

| | | |
|--------------------|--------|---------|
| PAR: 2.1.2 | P[211] | 0 ... 1 |
| Counting direction | | |
| 0 = no reverse | | |
| 1 = reverse | | |

| | | |
|----------------------|--------|--------------------------|
| PAR: 2.1.3 | P[000] | 0 ... 10000 ... 16777215 |
| Multiplier numerator | | |
| XXXXXXXX | | |

| | | |
|------------------------|--------|--------------------------|
| PAR: 2.1.4 | P[001] | 0 ... 10000 ... 16777215 |
| Multiplier denominator | | |
| XXXXXXXX | | |

| | | |
|---------------------------------|--------|---------|
| PAR: 2.1.5 | P[212] | 0 ... 3 |
| Reference fine | | |
| 0 = no function | | |
| 1 = rising edge (input 1 or 2) | | |
| 2 = falling edge (input 1 or 2) | | |
| 3 = front keys | | |

| | | |
|------------------|--------|---------|
| PAR: 2.1.6 | P[213] | 0 ... 2 |
| Reference coarse | | |
| 0 = no function | | |
| 1 = high signal | | |
| 2 = low signal | | |

| | | |
|--|--------|---------|
| PAR: 2.1.7 | P[209] | 0 ... 2 |
| Counting direction for setting reference value | | |
| 0 = independant from direction | | |
| 1 = when counting in positive direction | | |
| 2 = when counting in negative direction | | |

| | | |
|-----------------|--------|-----------------------------|
| PAR: 2.1.8 | P[003] | -9999999 ... 0 ... 99999999 |
| Reference value | | |
| -XXXXXXXX (AWE) | | |

| | | |
|---|--------|----------------|
| PAR: 2.1.9 | P[004] | 0 ... 99999999 |
| Counting range (no function when Hold/Reset is active (P[200])) | | |
| XXXXXXXX (AWE) | | |

| | | |
|--------------------------------------|--------|----------|
| PAR: 2.1.11 | P[233] | 0 ... 48 |
| Source for counting range | | |
| 0 = parameters counting range P[004] | | |
| 1...48 = nominal value 1...48 | | |

5.3 Menu 3 Serial

| | | |
|-------------|--------|----------|
| PAR: 3.0.1 | P[236] | 0 ... 31 |
| Unit adress | | |
| XX | | |

| | | |
|------------|--------|---------------|
| PAR: 3.0.2 | P[237] | 0 ... 1 ... 4 |
| Baudrate | | |
| 0 = 9600 | | |
| 1 = 19200 | | |
| 2 = 28800 | | |
| 3 = 38400 | | |
| 4 = 57600 | | |

| | | |
|--------------------|--------|---------|
| PAR: 3.0.3 | P[238] | 0 ... 1 |
| Number of stopbits | | |
| 0 = 1 Stopbit | | |
| 1 = 2 Stopbits | | |

| | | |
|------------|--------|---------|
| PAR: 3.0.4 | P[239] | 0 ... 2 |
| Parity | | |
| 0 = none | | |
| 1 = odd | | |
| 2 = even | | |

| | | |
|-----------------|--------|---------|
| PAR: 3.0.5 | P[240] | 0 ... 1 |
| Protocol | | |
| 0 = no function | | |
| 1 = ASCII | | |

5.4 Menu 4 Input

INPUT-1

| | | |
|---|--------|----------|
| PAR: 4.0.1 | P[249] | 0 ... 12 |
| Function input-1 | | |
| 0 = no function | | |
| 1 = coarse | | |
| 2 = reference fine | | |
| 3 = store | | |
| 4 = error reset SSI (only AP21) | | |
| 5 = start/stop cams | | |
| 6 = start cams | | |
| 7 = stop cams | | |
| 8 = lock input nominal values | | |
| 9 = lock input parameters | | |
| 10 = lock input nominal values + parameters | | |
| 11 = DAC Set Smin | | |
| 12 = DAC Set Smax | | |

INPUT-2

| | | |
|------------------|--------|----------|
| PAR: 4.0.2 | P[250] | 0 ... 12 |
| Function input-2 | | |
| XX (see input-1) | | |

5.5 Menu 5 Output

5.5.1 Submenu 5.1 – 5.4 Op1...4

OUTPUT 1...4

| | | |
|--|-----------------|----------------|
| PAR: 5.x.1 | P[252]...P[255] | 0 ... 7 |
| Function output-1 | | |
| 0 = cam | | |
| 1 = cam inverted | | |
| 2 = SSI error (high = no error) only AP21 | | |
| 3 = Start/Stop error (no magnet or time-out) only AP23 | | |
| 4 = reference/adjustment set | | |
| 5 = cams active | | |
| 6 = ASCII protocol | | |
| 7 = Counting direction (high = downwards counting) | | |

| | | |
|--|-----------------|-------------------|
| PAR: 5.x.2 | P[094]...P[097] | 0 ... 5000 |
| Dynamic cams (only when with cam function 1, 4 and 5 and source = actual position) | | |
| X.XXX (sec) input 0 = no function | | |

5.6 Menu 6 Cam

5.6.1 Submenu 6.1 ... 6.12 CA1...12

CAM-1...12

| | | |
|--|-----------------|---------|
| PAR: 6.x.1 | P[256]...P[267] | 0 ... 5 |
| Cam function | | |
| 0 = no function | | |
| 1 = range | | |
| 2 = actual position >= limit value | | |
| 3 = actual position <= limit value | | |
| 4 = actual position >= limit value (Timer) | | |
| 5 = actual position <= limit value (Timer) | | |

| | | |
|--------------------------|-----------------|---------|
| PAR: 6.x.2 | P[280]...P[291] | 0 ... 2 |
| Source | | |
| 0 = actual position | | |
| 1 = actual velocity | | |
| 2 = actual linearization | | |

| | | |
|--|-----------------|----------|
| PAR: 6.x.3 | P[304]...P[315] | 0 ... 12 |
| Source cam begin / limit value (limit value if cam function = 2 or 3) | | |
| 0 = parameters cam begin | | |
| 1...12 = Nominal value 1...12 | | |

| | | |
|-------------------------------|-----------------|----------|
| PAR: 6.x.4 | P[292]...P[303] | 0 ... 12 |
| Source cam end | | |
| 0 = parameters cam end | | |
| 1...12 = Nominal value 1...12 | | |

| | | |
|---|-----------------|--------------------------------|
| PAR: 6.x.5 | P[007]...P[018] | -9999999 ... 1000 ... 99999999 |
| Cam begin / limit value (limit value if cam function = 2 or 3) | | |
| -XXXXXXX | | |

| | | |
|------------|-----------------|-------------------------------|
| PAR: 6.x.6 | P[031]...P[042] | -9999999 ... 2000 ...99999999 |
| Cam end | | |
| -XXXXXXX | | |

| | | |
|----------------|-----------------|--------------|
| PAR: 6.x.7 | P[055]...P[066] | 0 ... 999999 |
| Hysteresis cam | | |
| XXXXXX | | |

| | | |
|----------------------|-----------------|---------|
| PAR: 6.x.8 | P[268]...P[279] | 0 ... 4 |
| Assign cam to output | | |
| 0 = no output | | |
| 1...4 = output 1-4 | | |

| | | |
|--|-----------------|------------|
| PAR: 6.x.9 | P[120]...P[131] | 0 ... 5000 |
| Cam switching time (only with cam function 4 en 5) | | |
| X.XXX (sec) ingave 0 = 0,1 sec | | |

5.7 Menu 7 Analog output

5.7.1 Submenu 7.1 Config

| | | |
|---------------------|--------|---------|
| PAR: 7.1.1 | P[231] | 0 ... 2 |
| Selection DA output | | |
| 0 = inactive | | |
| 1 = voltage | | |
| 2 = current | | |

| | | |
|---------------------------|--------|---------|
| PAR: 7.1.2 | P[230] | 0 ... 3 |
| Selection DA source | | |
| 0 = actual position | | |
| 1 = actual velocity | | |
| 2 = actual velocity abs | | |
| 3 = actual linearization | | |

5.7.2 Submenu 7.2 DA-U (voltage)

DA PAR 7.2.1...7.2.4 = 0: DA not active

| | | |
|--------------|--------|-------------------|
| PAR: 7.2.1 | P[080] | -100000 ... 99999 |
| Umin DA | | |
| -XX.XXXX (V) | | |

| | | |
|--------------|--------|--------------------------|
| PAR: 7.2.2 | P[081] | -99999 ... 100000 |
| Umax DA | | |
| -XX.XXXX (V) | | |

| | | |
|-----------------|--------|---|
| PAR: 7.2.3 | P[082] | -9999999... -100000 ... 99999999 |
| S-Umin DA | | |
| -XXXXXXXX (AWE) | | |

| | | |
|-----------------|--------|---|
| PAR: 7.2.4 | P[083] | -9999999 ... 100000 ... 99999999 |
| S-Umax DA | | |
| -XXXXXXXX (AWE) | | |

| | | |
|--------------------|--------|----------------|
| PAR: 7.2.5 | P[234] | 0 ... 1 |
| Source for Smin | | |
| 0 = parameter Smin | | |
| 1 = teach by input | | |

| | | |
|--------------------|--------|----------------|
| PAR: 7.2.6 | P[235] | 0 ... 1 |
| Source for Smax | | |
| 0 = parameter Smax | | |
| 1 = teach by input | | |

5.7.3 Submenu 7.3 DA-I (current)

DA PAR 7.3.1...7.3.4 = 0: DA not active

| | | |
|---------------|--------|---------------------------|
| PAR: 7.3.1 | P[084] | -200000 ... 199999 |
| Imin DA | | |
| -XX.XXXX (mA) | | |

| | | |
|---------------|--------|---------------------------|
| PAR: 7.3.2 | P[085] | -199999 ... 200000 |
| Imax DA | | |
| -XX.XXXX (mA) | | |

| | | |
|-----------------|--------|---|
| PAR: 7.3.3 | P[086] | -9999999 ... -200000 ...99999999 |
| S-Imin DA | | |
| -XXXXXXXX (AWE) | | |

| | | |
|-----------------|--------|--|
| PAR: 7.3.4 | P[087] | -9999999 ... 20000 ... 99999999 |
| S-lmax DA | | |
| -XXXXXXXX (AWE) | | |

| | | |
|--|--------|----------------|
| PAR: 7.3.5 | P[234] | 0 ... 1 |
| Source for Smin | | |
| 0 = parameter Smin 1 = teach by input | | |

| | | |
|--|--------|----------------|
| PAR: 7.3.6 | P[235] | 0 ... 1 |
| Source for Smax | | |
| 0 = parameter Smax 1 = teach by input | | |

5.8 Menu 8 Linearization

5.8.1 Submenu 8.1 Config

| | | |
|--|--------|----------------|
| PAR: 8.1.1 | P[246] | 0 ... 2 |
| Source | | |
| 0 = inactive 1 = actual position 2 = actual velocity | | |

| | | |
|------------------|--------|------------------------|
| PAR: 8.1.2 | P[247] | 2 ... 10 ... 30 |
| Number of points | | |
| XX | | |

| | | |
|---|--------|----------------|
| PAR: 8.1.3 | P[248] | 0 ... 6 |
| Number of decimals for actual position linearization | | |
| 0 = geen 1 = X.X 2 = X.XX 3 = X.XXX 4 = X.XXXX 5 = X.XXXXX 6 = X.XXXXXX | | |

| | | |
|------------------|--------|---------|
| PAR: 8.1.4 | P[241] | 0 ... 2 |
| Mode | | |
| 0 = 4-Quadrant | | |
| 1 = Mirror X-as | | |
| 2 = Mirror XY-as | | |

5.8.2 Submenu 11.2 ... 11.31 P1...P30

P1...30 → x = 2...31

| | | |
|------------|-----------------|-----------------------------|
| PAR: 8.x.1 | P[140]...P[169] | -9999999 ... 0 ... 99999999 |
| P1-X | | |
| -XXXXXXXX | | |

| | | |
|------------|-----------------|-----------------------------|
| PAR: 8.x.2 | P[170]...P[199] | -9999999 ... 0 ... 99999999 |
| P1-Y | | |
| -XXXXXXXX | | |

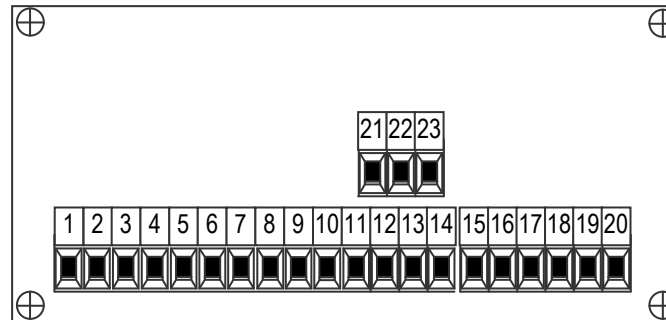
5.9 Overview parameters

| <u>No</u> | <u>Description</u> | <u>Menu</u> |
|---------------|--------------------------------------|----------------|
| [000] | = Multiplier numerator | 2.1.3 |
| [001] | = Multiplier denominator | 2.1.4 |
| [002] | = no function | |
| [003] | = Reference value | 2.1.8 |
| [004] | = Counting range | 2.1.9 |
| [005], [006] | = no function | |
| [007]...[018] | = Cam begin / limit value | 6.1.5...6.12.5 |
| [019]...[030] | = no function | |
| [031]...[042] | = Cam end | 6.1.6...6.12.6 |
| [043]...[054] | = no function | |
| [055]...[066] | = Hysteresis cam | 6.1.7...6.12.7 |
| [067]...[079] | = no function | |
| [080] | = Umin DA | 7.2.1 |
| [081] | = Umax DA | 7.2.2 |
| [082] | = S-Umin DA | 7.2.3 |
| [083] | = S-Umax DA | 7.2.4 |
| [084] | = Imin DA | 7.3.1 |
| [085] | = Imax DA | 7.3.2 |
| [086] | = S-Imin DA | 7.3.3 |
| [087] | = S-Imax DA | 7.3.4 |
| [088] | = Measuring time velocity | 1.0.1 |
| [089]...[093] | = no function | |
| [094]...[097] | = Dynamic cam output 1...4 | 5.1.2...5.4.2 |
| [098]...[119] | = no function | |
| [120]...[131] | = Cam switching time | 6.1.9...6.12.9 |
| [132]...[139] | = no function | |
| [140]...[169] | = Pn-X (linearization) | 8.2.1...8.31.1 |
| [170]...[199] | = Pn-Y (linearization) | 8.2.2...8.31.2 |
| [200], [201] | = no function | |
| [202] | = Integrator velocity | 1.0.2 |
| [203] | = Number of decimals | 1.0.3 |
| [204] | = Store function | 1.0.4 |
| [205] | = Store signal | 1.0.5 |
| [206] | = Power failure protection | 1.0.6 |
| [207] | = Service functions | 1.0.7 |
| [208] | = Default monitor function | 1.0.8 |
| [209] | = Counting direction reference fine | 2.1.7 |
| [210] | = Input type and edge multiplication | 2.1.1 |
| [211] | = Counting direction | 2.1.2 |
| [212] | = Reference fine | 2.1.5 |

| No | Description | Menu |
|---------------|--------------------------------------|----------------|
| [213] | = Reference coarse | 2.1.6 |
| [214]...[229] | = no function | |
| [230] | = Selection DA source | 1.1.2 |
| [231] | = Selection DA output | 7.1.1 |
| [232] | = no function | |
| [233] | = Source for counting range | 2.1.10 |
| [234] | = Source for Smin DA | 7.2.5/7.3.5 |
| [235] | = Source for Smax DA | 7.2.6/7.3.6 |
| [236] | = Unit adress | 3.0.1 |
| [237] | = Baudrate (RS232) | 3.0.2 |
| [238] | = Stopbits (RS232) | 3.0.3 |
| [239] | = Parity (RS232) | 3.0.4 |
| [240] | = Protocol (RS232) | 3.0.5 |
| [241] | = Mode linearization | 8.1.4 |
| [242]...[245] | = no function | |
| [246] | = Source (linearization) | 8.1.1 |
| [247] | = Number of points (linearization) | 8.1.2 |
| [248] | = Number of decimals (linearization) | 8.1.3 |
| [249], [250] | = Function input 1...2 | 4.0.1/4.0.2 |
| [251] | = no function | |
| [252]...[255] | = Function output1...4 | 5.0.1...5.0.4 |
| [256]...[267] | = Cam function | 6.1.1...6.12.1 |
| [268]...[279] | = assign cam to output | 6.1.8...6.12.8 |
| [280]...[291] | = Source cam | 6.1.2...6.12.2 |
| [292]...[393] | = Source for cam end | 6.1.4...6.12.4 |
| [304]...[315] | = Source for cam begin/limit value | 6.1.3...6.12.3 |
| [316]...[399] | = no function | |

6 Connections

Connections on the rear

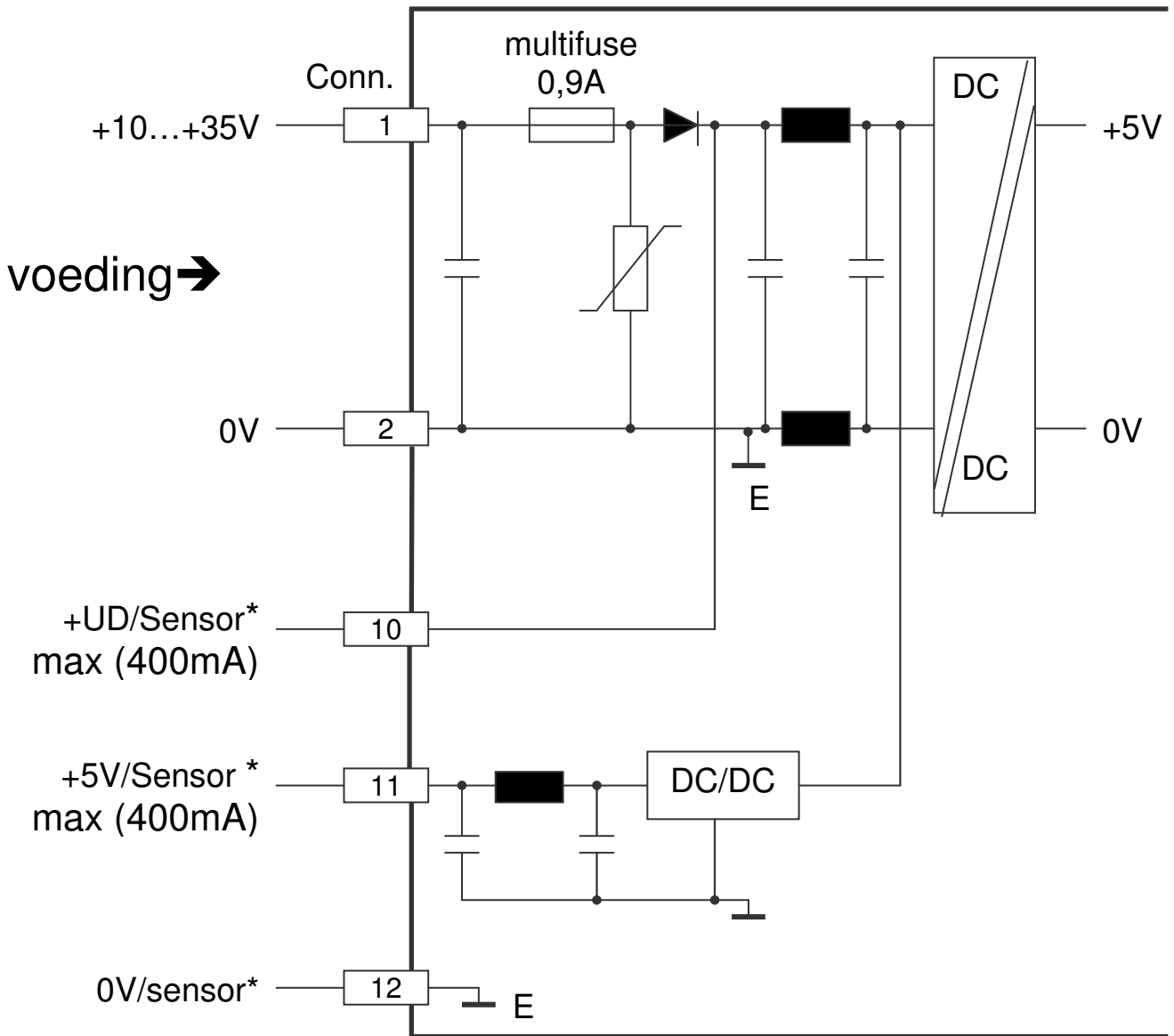


6.1 Overview clamp connections

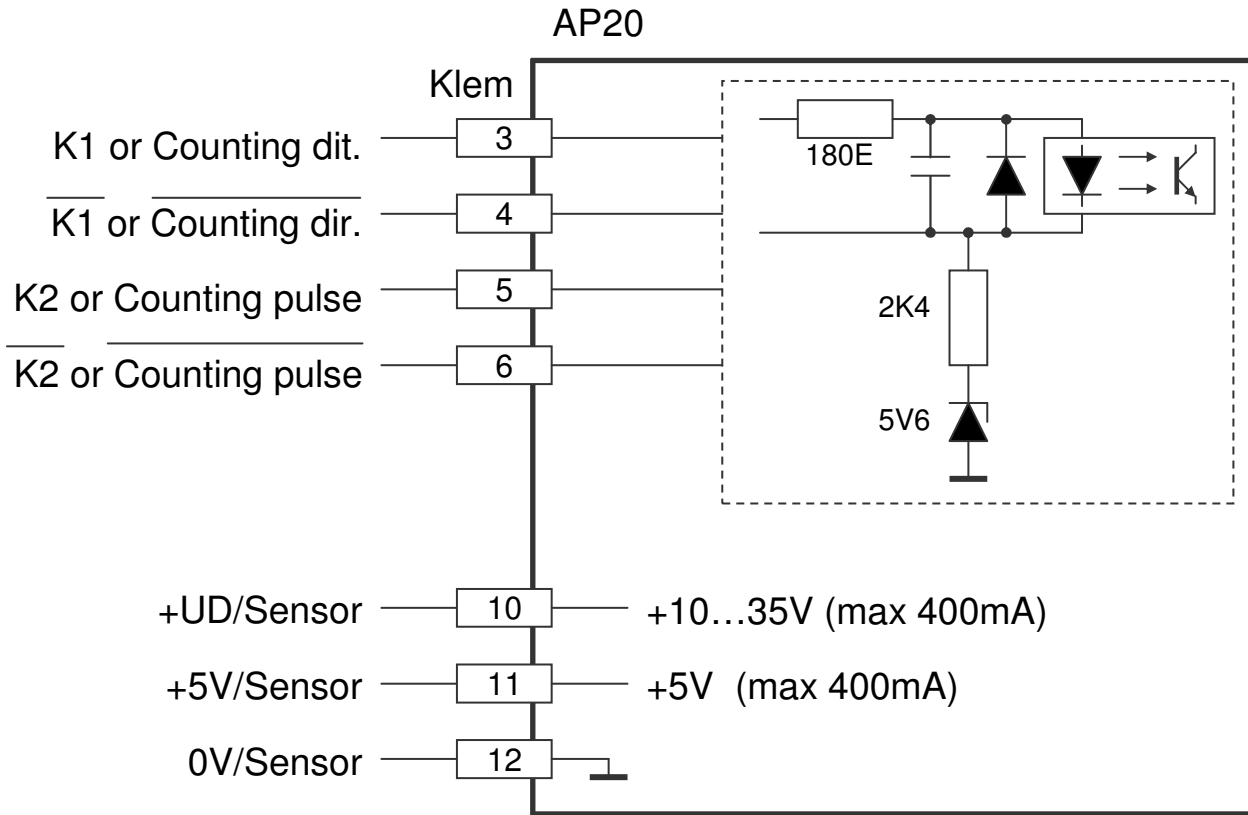
1. +10...+35V supply
2. 0V supply
3. K1 or counting dir.
4. /K1 or counting dir.
5. K2 or counting pulse
6. /K2 or counting pulse
7. Input-1
8. Input-2
9. common for inputs (0V)
10. +10...35V DC supply output for sensor
11. +5V DC supply output for sensor
12. 0V for sensor
13. TxD
14. RxD
15. Output -1
16. Output -2
17. Output -3
18. Output -4
19. 0V for outputs
20. +U for outputs

21. 0V analog
22. U-out
23. I-out

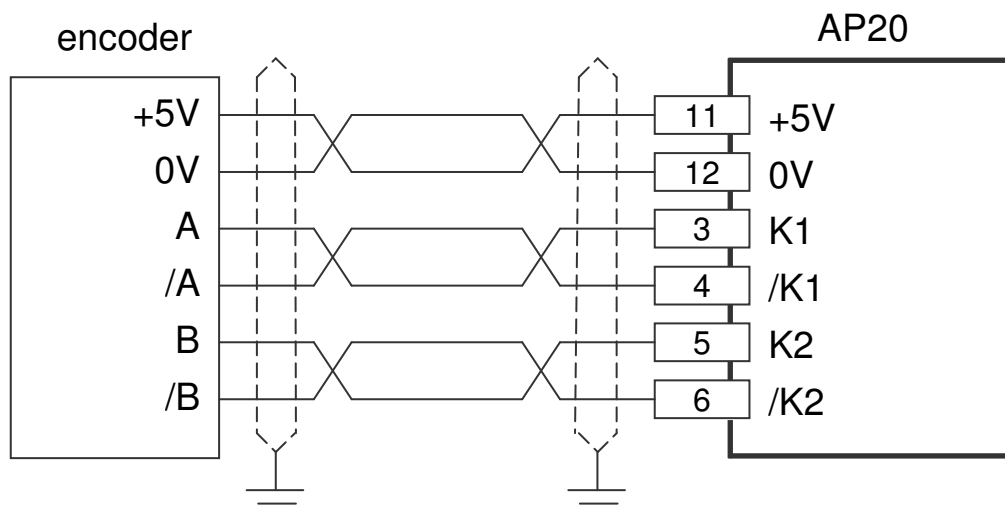
6.2 Supply



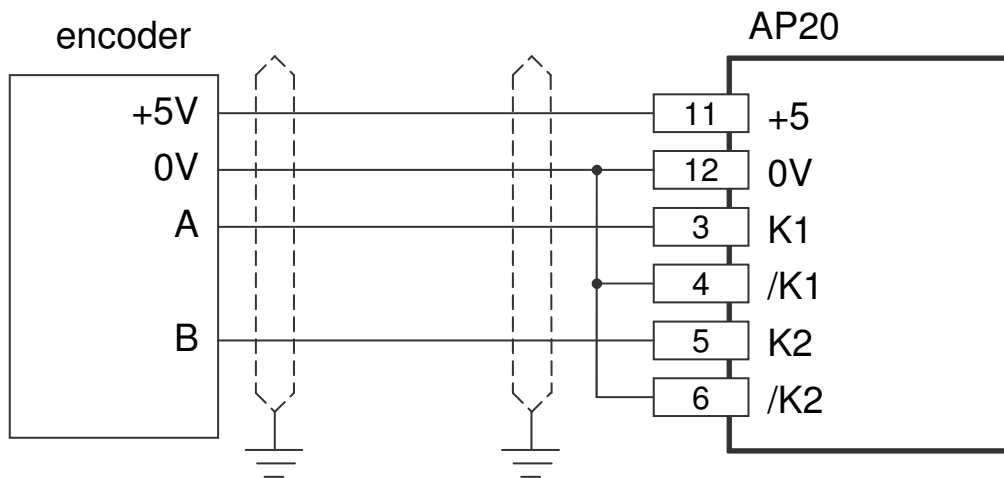
6.3 Counting input



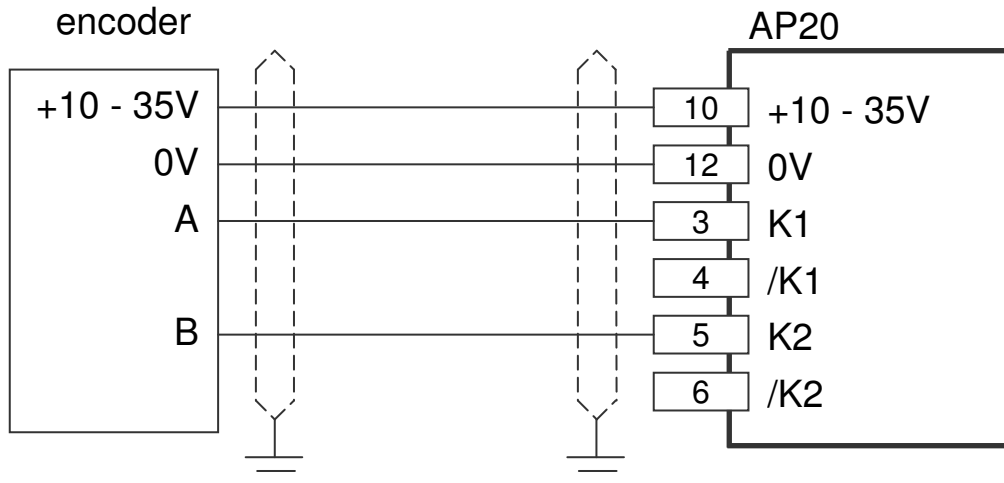
6.4 Encoder 5V with inverted signals



6.5 Encoder 5V without inverted signals



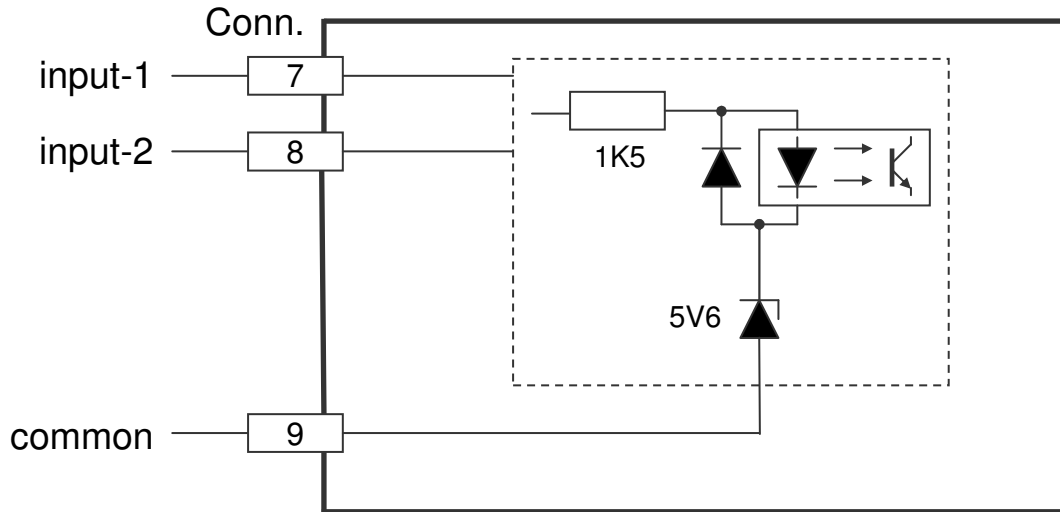
6.6 Encoder 10 – 30V



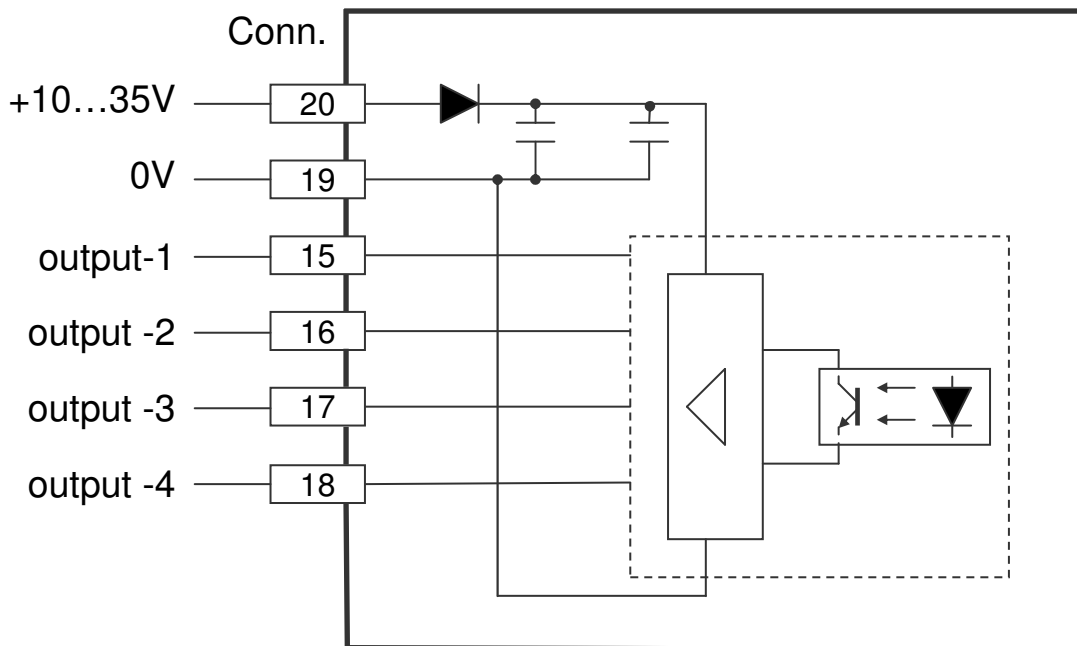
CAUTION!

When using 24V encoders don't connect terminal 4 and 6.

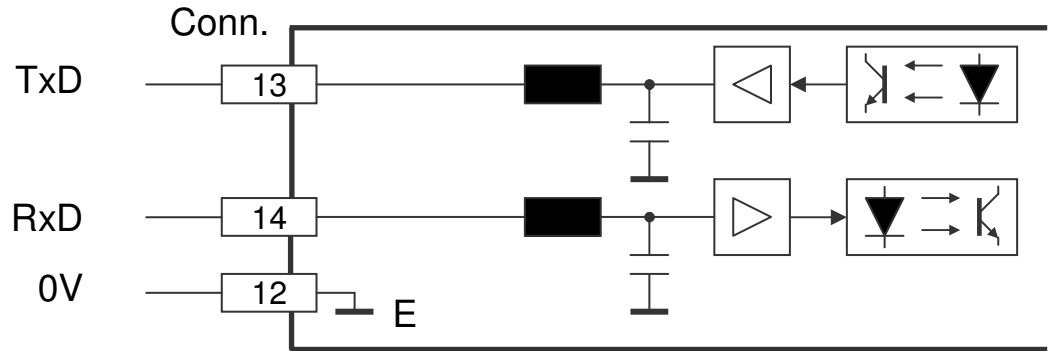
6.7 Digital inputs



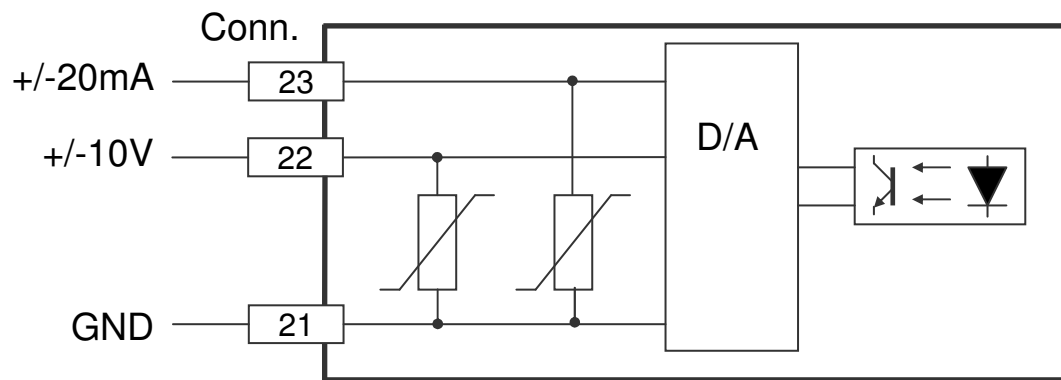
6.8 Digital outputs



6.9 RS232



6.10 Analog output



7 Technical specifications

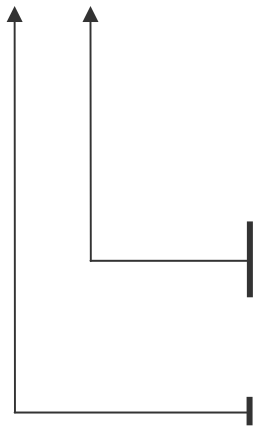
7.1 Specifications

| | |
|-------------------------|--|
| - Supply voltage | 10...35V DC (power failure not active) 16...35V DC (power failure active) |
| current consumption | < 150mA |
| - Output voltage | for external encoder |
| +UD | max 400mA depending on supply voltage |
| +5V | max 400mA |
| - Processor | |
| μController | XC167 |
| Data memory | EEPROM |
| Cycle time | 250μS (fixed) |
| Counting range | -9999999...+99999999 |
| - Counting input | optically isolated |
| signal level | low (5V): 0...+0.8V high (5V): +2.8V...+5V low (24V): 0...+5V high (24V): +15V...+35V |
| voltage output | 5,3V max. 350mA |
| input resistance | appr. 3k Ohm at 24V appr. 0.35k Ohm at 5V |
| input frequency | max. 150 kHz |
| - Digital inputs 1...2 | optically isolated |
| input resistor | low: 0...+5V high: +10V...+35V appr. 1.8k Ohm at 24V |
| - Digital outputs 1...4 | optically isolated, N FET, short-circuit proof |
| I _{max} | 500 mA (min load 200 μA) |
| Supply voltage | 35V max. |
| - Voltage output | galvanically isolated |
| range | max. -10V ... +10V |
| resolution | 305 μV |
| offset-temp. coeff. | < 20 ppm/ °C |
| I _{max} | +/-12mA |

| | |
|---------------------------------|--|
| - Current output range | galvanically isolated max. -20mA ... +20mA |
| resolution | 610 μ A |
| offset-temp. coeff. | < 20 ppm/ °C |
| Rmax | 550 Ohm |
| - Serial communication | RS232 C |
| - Display | 8 decades 7-segments LED |
| digit height | 14 mm |
| - Temperature range | 0...50 °C |
| - Connection diameter | 1,6 mm ² (raster 3,81mm) |
| - Electromagnetic compatibility | in accordance with guideline 2004/108/EC |
| emission | NEN-EN-IEC61000-6-3:2007 |
| immunity | NEN-EN-IEC61000-6-3:2005 |
| - Weight | < 0.25 kg |
| - Sealing | front IP50, with protective hood IP54 rear IP20 |

7.2 Typekey

AP20- X X



Analog output

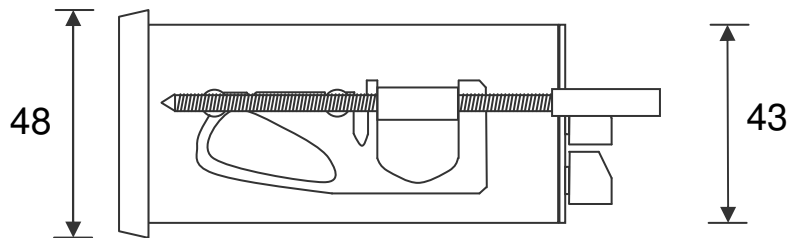
- 0 = no analog in- and output
- A = analog in- and output

Digital outputs

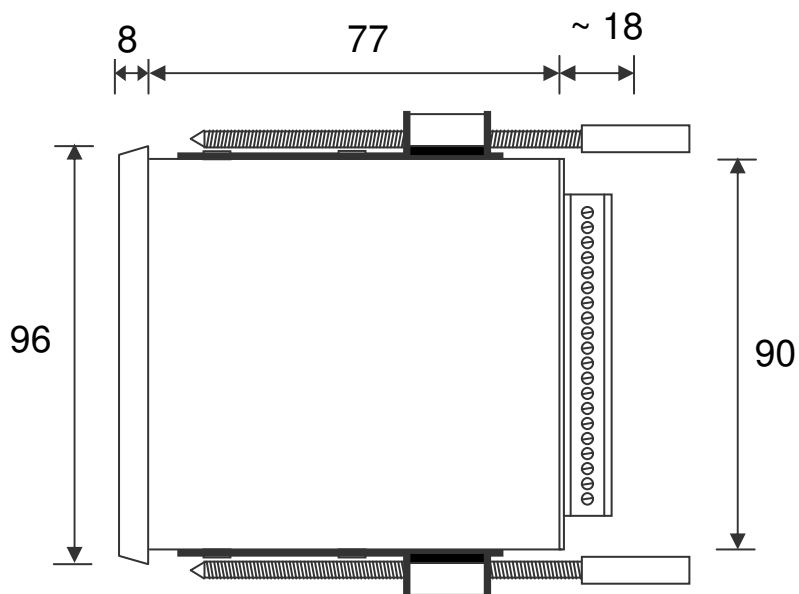
- C = no digital outputs
- D = 4 digital outputs

7.3 Dimensions AP20

Side view

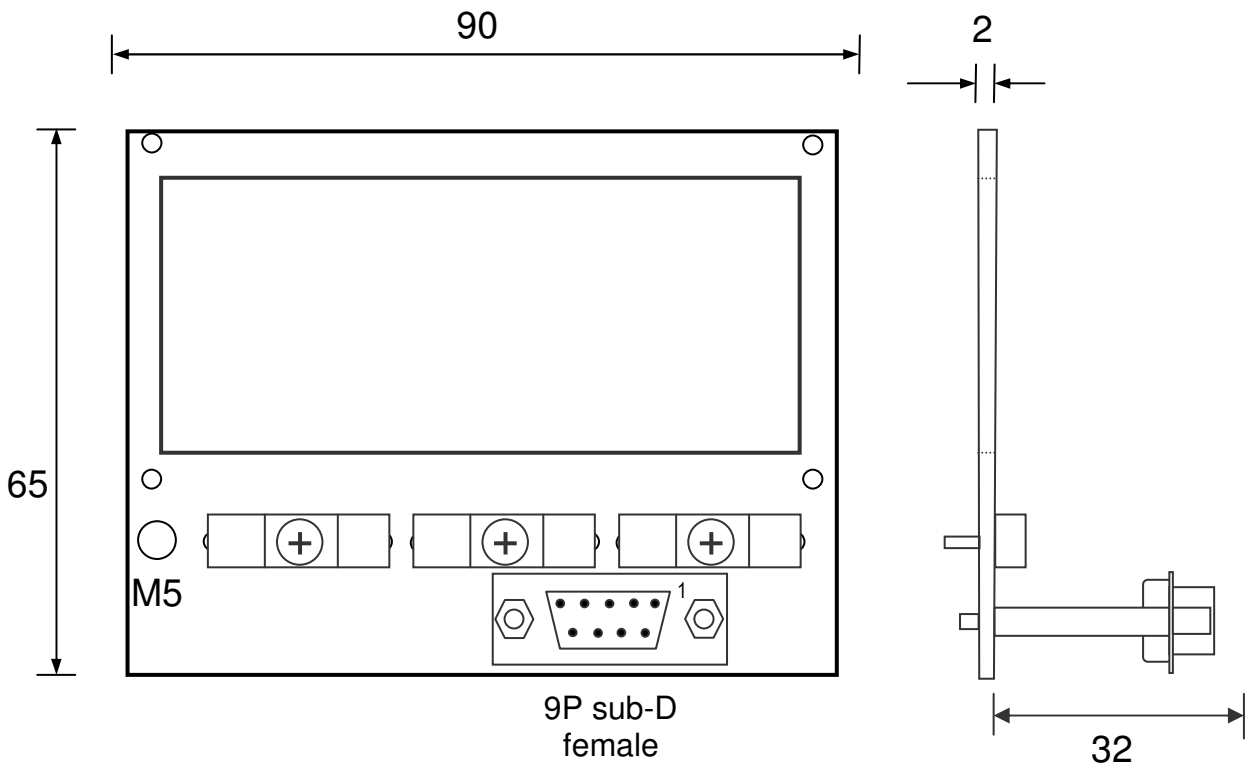


Top view

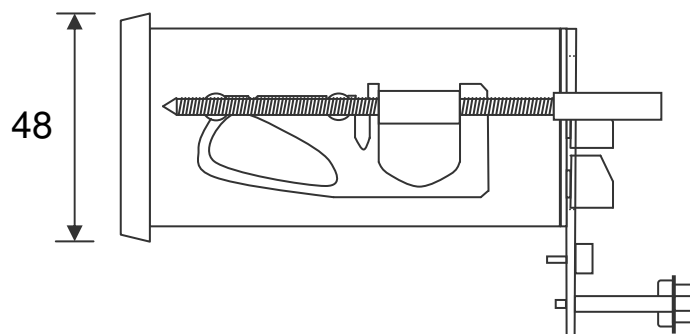


7.4 Dimensions EMC bracket type EMC-B02

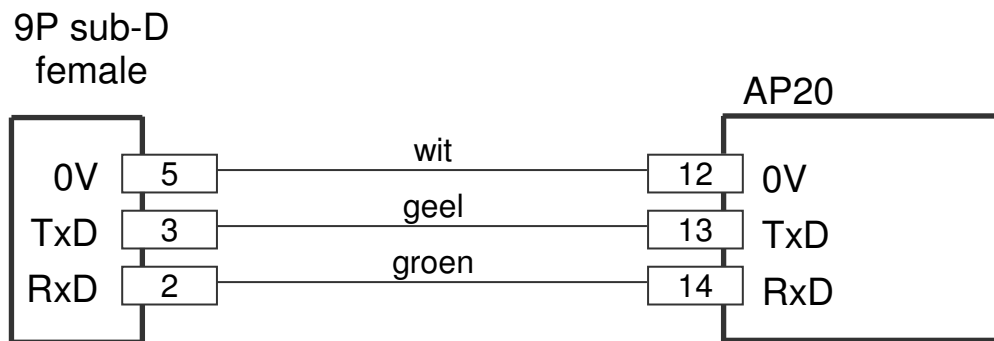
With RS232 (9P sub-D) on EMC bracket



Side view with EMC bracket



7.4.1 Connections RS232 on 9P sub-D connector



7.5 Dimensions protective hood type CDS-B02

