Manual AP22 Analog Display

- **8 Digit display in DIN-enclosure 96 X 48 mm**

- **Supply voltage 10 – 35V DC**

- **All in- and outputs optically isolated**

- **Programmable input for +/-10V or +/-20mA**

- **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 Linearization function**

- **Programmable PeakHold function**

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

Table of contents

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

1 Introduction

1.1 General

The microcontroller based AP22 has a analog input for voltage or current signals. The 16bit input has a span of +/-10V or +/-20mA for all the known signals to be configured.

It is standard equipped with 2 digital inputs and 4 digital outputs, all free programmable. The AP22 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 AP22 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 AP22 is configurable for numerous applications by adjusting its parameters.

The AP22 can be programmed with the DST2 PC-based software.

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

1.2 Important information

✓ The AP22 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 AP22.
✓ If through a failure or fault of the AP22 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 AP22.
✓ Necessary repairs to the AP22 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 AP22:
✓ 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.

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

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   Decimal
238H   Hexadecimal
244G   Gray
10010011B   Binary

for example 220D = DCH = 11011100B

1.4.4   Edges

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

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

2   Operation

2.1 Key functions

[P]

[P] key
- Cycle through monitoring displays
- Activate programming mode (in combination with other keys)

[+1]

[+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

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

2.2 Key functions in programming mode

[P]

[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]

 [+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)

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

2.3 Display functions

2.3.1   Status functions

Power on

| 8.8.8.8.8.8.8.8. | Appr. 1sec.

↓

| 12345678 | Operating (normal) mode
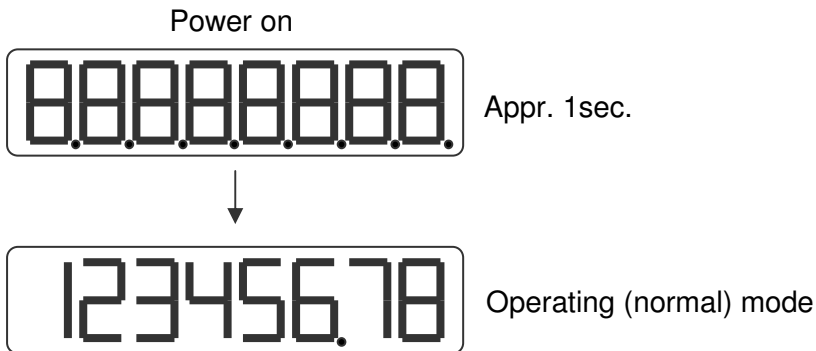
2.3.2   Error messages

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:

Parameter error number

| Err. P203 | Error parameter 203
(Parameter out of min/max value)

General error number

| Err.   700 | General error 700

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
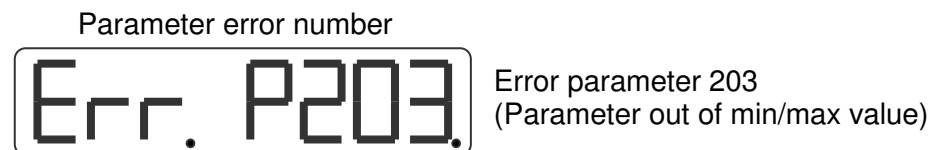
2.3.3   Survey of error messages

Error no:
000...499   Parameter error is displayed as PXXX on the display.

716 = Umin >= Umax (analog output)
717 = Imin >= 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 Xn <= Xn-1
940 = Linearization (mode 1 or 2) X1 <> 0
941 = Linearization mode 1) Y1 <> 0

Error messages for cams (latst 2 digits = cam number)
1001…1012   length cam = 0 (cam begin = cam end) or
             cam begin <= cam end (with no counting range active)
1101…1112   length cam <= Hysteresis
1201…1212   (2 * hysteresis) + cam length >= counting range
1301…1312   cam begin and/or cam end outside counting range
             (incl. hysteresis)
1401...1412 hysterese 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

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

3   Programming

There are three different modes of operation:

- Automatic mode
- Programming mode for nominal values
- Programming mode for parameters
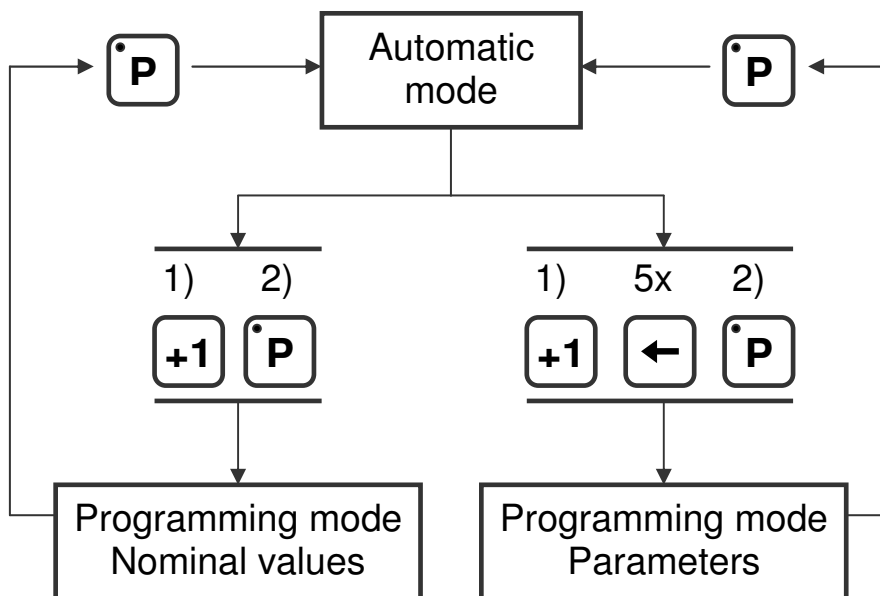
1) hold

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.

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

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
- Actual PeakHold 1
- Actual PeakHold 2
- Voltage or current of the AD (analog in)

	Variant		Actuele waarde
	Act. PoS.	Na 2sec. →	398.05
	Act.SPEEd.	→	23.40
[P]	Act. I in	→	10.0000
	P-HoLd 1	→	23.40
	P-HoLd 2	→	23.40
	U dA out	→	10.0000
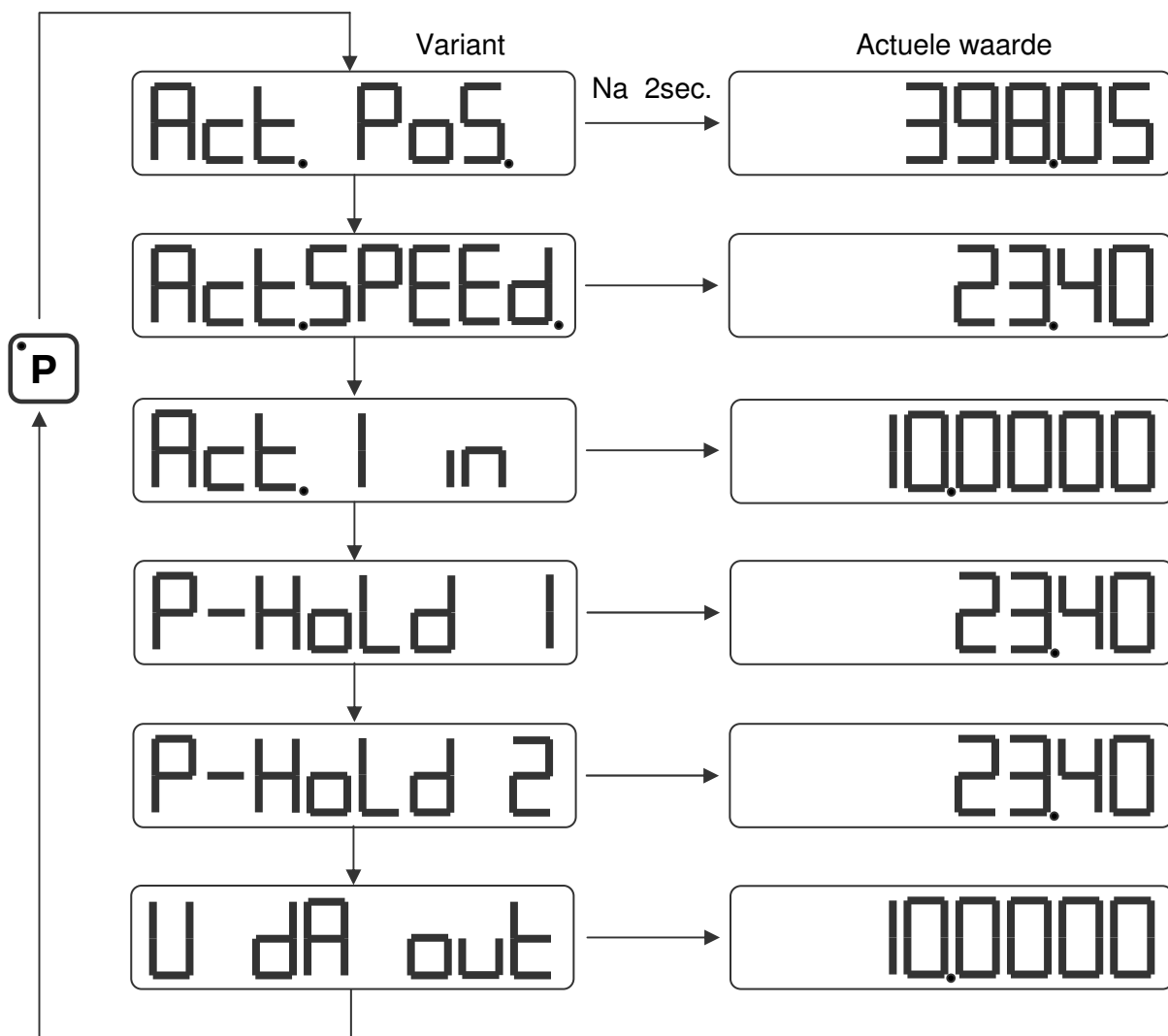
Parameter P[208] determines which option is visible after start-up.

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

3.1.2   Displaying the type number

Automatic mode

| 12345678 |

↓

| +1 |

↓

| AP20-CA | Type
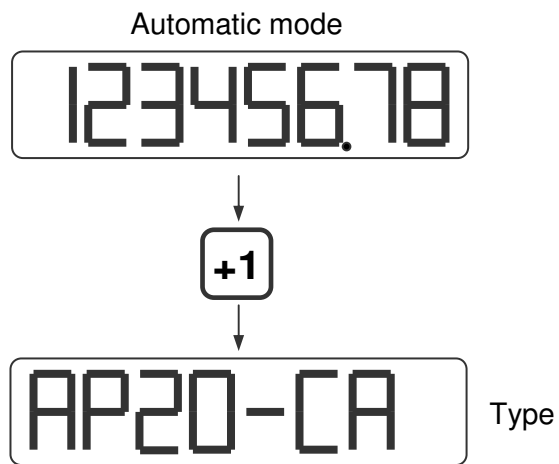
3.1.3   Displaying the software-version

Automatic mode

| 12345678 |

↓

| ← |

↓

| SoFt. 1.01 | Standard software

↓

| → | (Keep | ← | pressed)

↓

| SPEC. 1.05 | Custom software

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
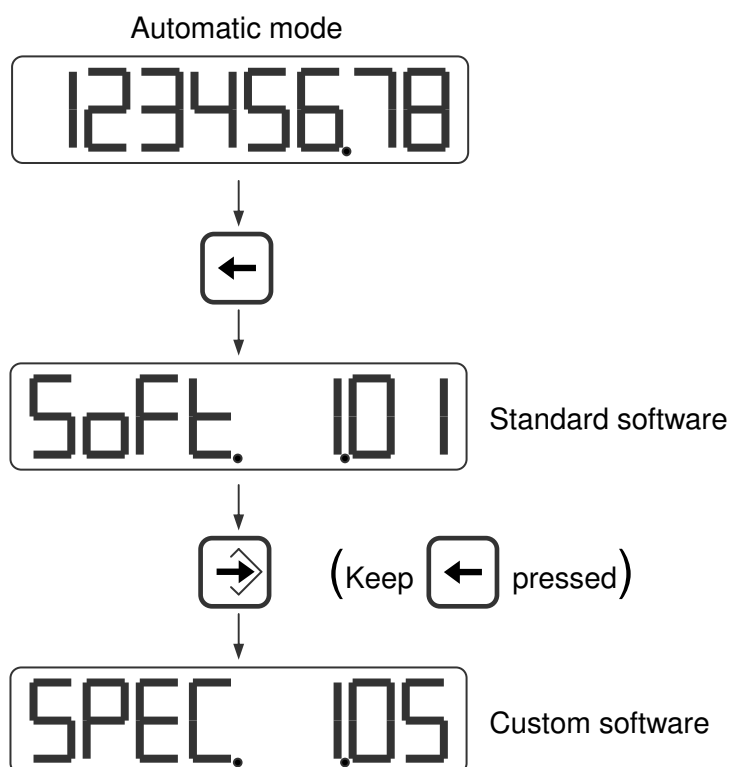
3.1.4   Status in- and outputs

Automatic mode
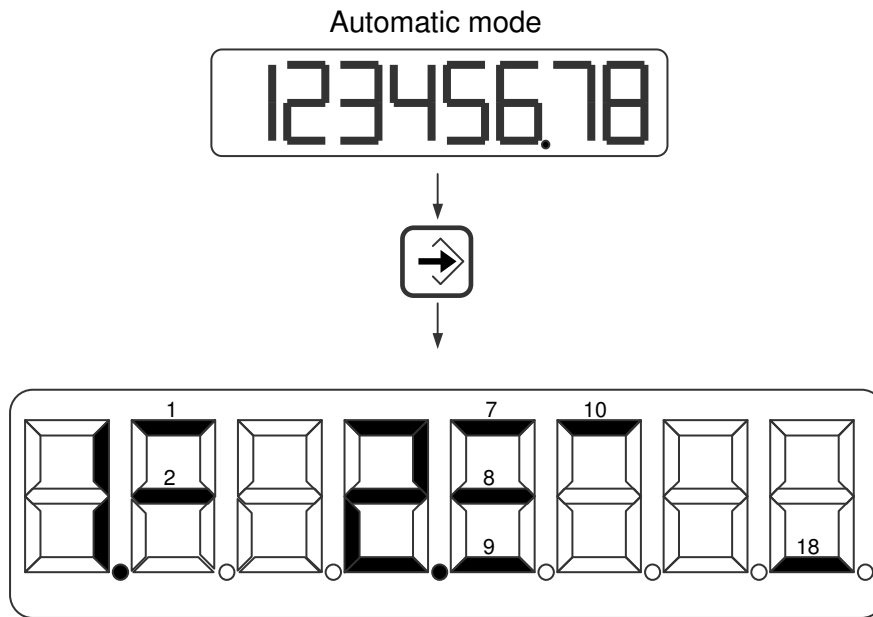
Inputs	Outputs	Outputs
1 = input-1	7 = output-1	18 = Cams active
2 = input-2	8 = output -2	
	9 = output -3	
	10 = output -4	

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

3.2 Changing nominal values
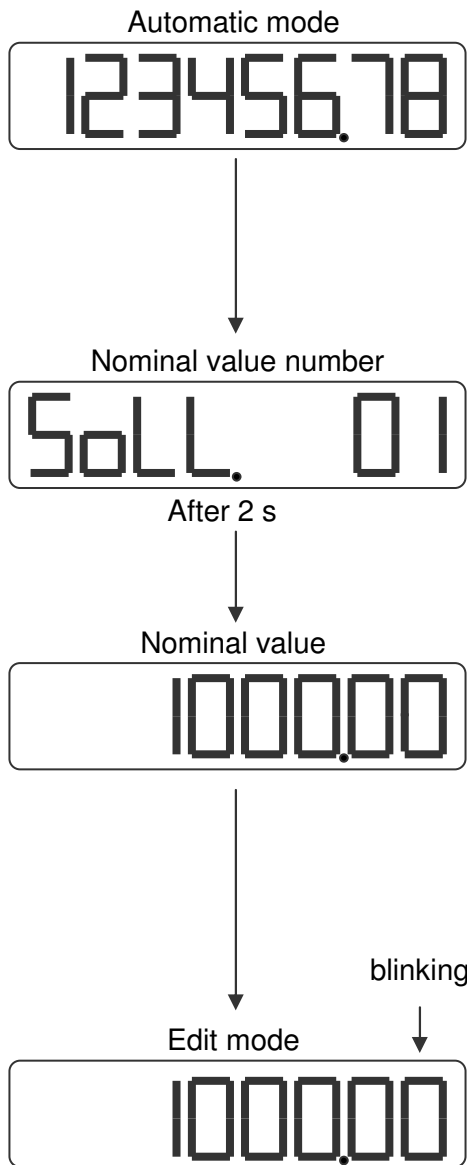
Access to nominal values

Automatic mode

```
12345678
```

+1 Then P *)

Nominal value number

```
SoLL    01
```

After 2 s

Select nominal values

P Exit programming mode

+1 Nominal value number +1

← Activate edit mode

→ Nominal value number +1

Nominal value

```
100.00
```

Changing values

blinking

Edit mode

```
100.00
```

P Exit edit mode

+1 Increase digit

← Move one digit left

→ Confirm change

*) ← Then → Clear input

*) keep pressed

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
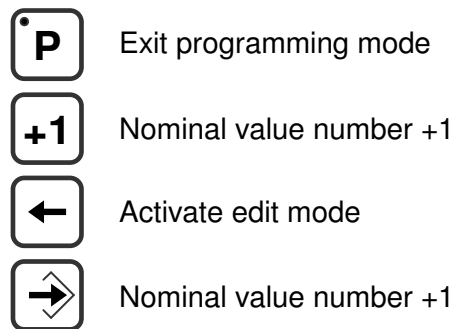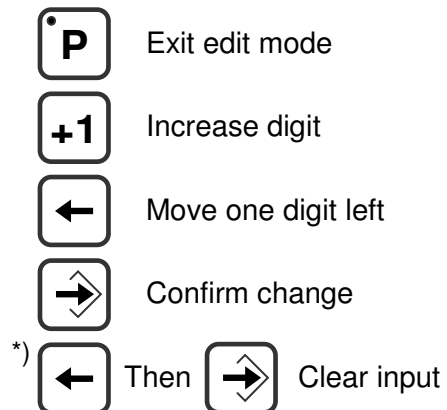
3.3 Changing parameters

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   (niet actief voor AP22)
    7.1 ConFG.
    7.2 dA-U
    7.3 dA-I
8 Lin                          Example:
    8.1 ConFG.                 PAr. 6.1.1 is
    8.2 P 1                    menu 6, submenu 1, parameter 1
    ... ...
    ... ...
    8.31 P30
9 P-HoLd
    9.1 Hold1
    9.2 Hold2
```

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

3.3.2 Input parameters

Automatic mode

```
12345678
```

Menu

```
1 ConFiG
```
↑
Menu

Submenu

```
2.1 Cnt.
```
↑   ↑
Menu   submenu

Parameter number

```
P  2.1 1
```
          ↑   ↑   ↑
After 2s Menu   submenu Par.

Parameter value

```
100.00
```

Edit mode

blinking
↓
```
100.00
```
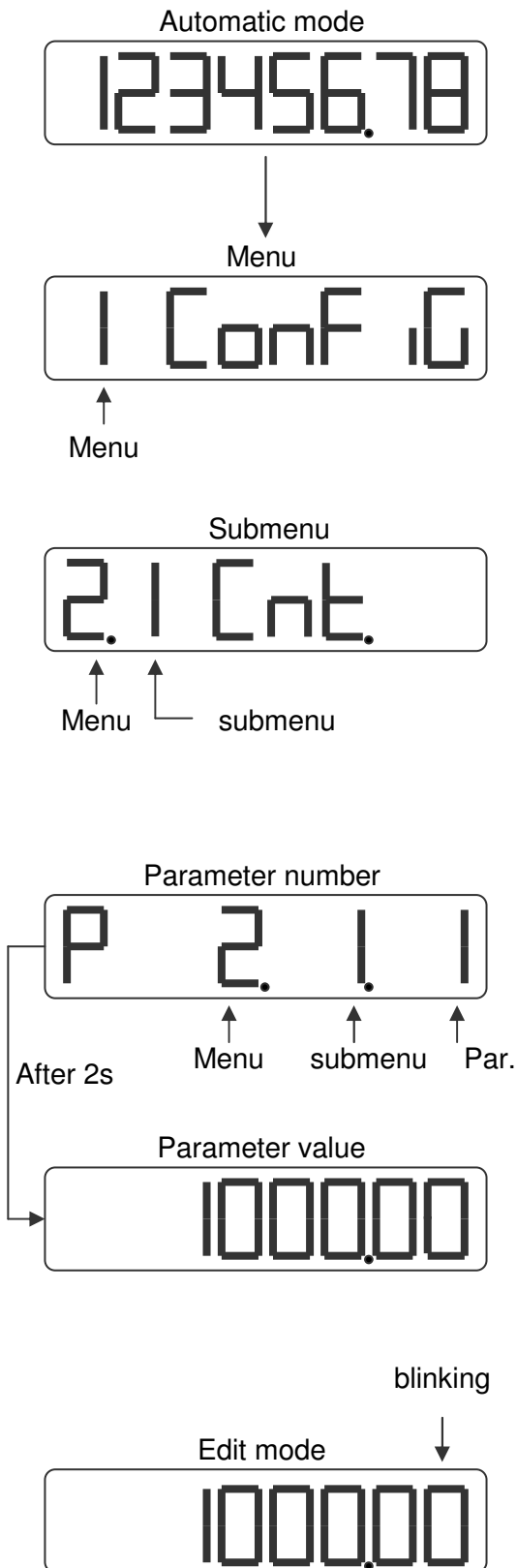
*) keep pressed down

Access parameters
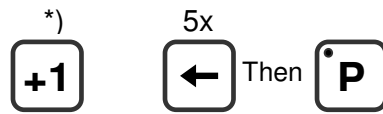
*)   5x
[+1]   [←] Then [P]

Menu selection

[P]   Exit programming mode

[+1]   Menu item +1

[→]   To submenu/parameter number

Submenu selection

[P]   Back to menu

[+1]   Submenu item +1

[→]   To parameter number

Selecting parameters

[P]   Back to menu/submenu

[+1]   Parameter number +1

[←]   Activate edit mode

[→]   Parameter number +1

Changing parameters

[P]   Exit edit mode

[+1]   Increase digit-value

[←]   Move 1 digit to the left

[→]   Confirm input

*)
[←] Then [→] Clear input

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
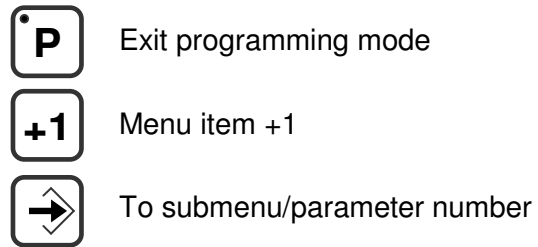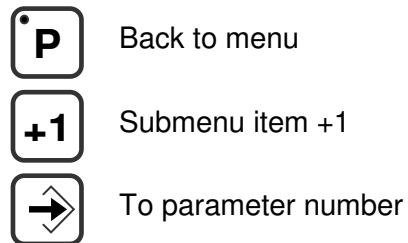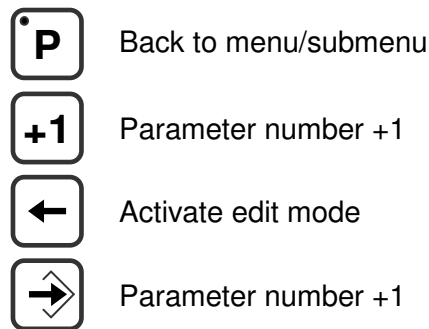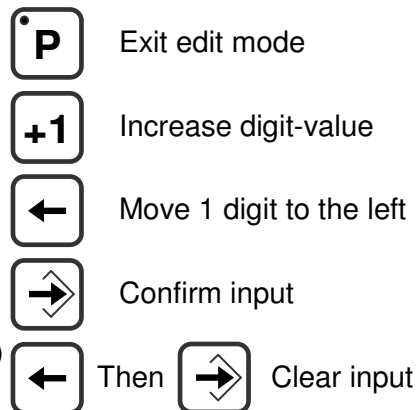
4   Functions

4.1   Analog input

The AP22 has an optional, galvanic isolated analog input. Using parameter P[226] it is possible to choose between a current input or a voltage input. When using the current input DIP-switch must be in the "on" position.

The analog input value (vloltage or current) is converted to AWE units.
 (for example 0 – 10V => 0 – 1200,0 mm)

There are 2 Parameters who configure the dynamic response of the analog input:

P[104] = measuring time
The smaller the measurement time the more dynamic the analog input will be.

P[225] = integrator
The number of cycles are programmed. The average analog value (in AWE) of the programmed cycles is calculated.

> *Example:*
> *Measurement time = 60ms, integrator = 10.*
> *The actual analog value will be refreshed every 60 ms and is the average velocity during the last 10 measurements.*

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

4.1.1   Voltage input

The voltage input has a resolution of 305 µV and is programmable through the parameters below.

P[105] = U1 in V (input in 0,0001V units)
P[106] = U2 in V (input in 0,0001V units)
P[107] = S1 in AWE (actual value at U1)
P[108] = S2 in AWE (actual value at U2)
P[104] = measuring time analog
P[225] = integrator analog

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
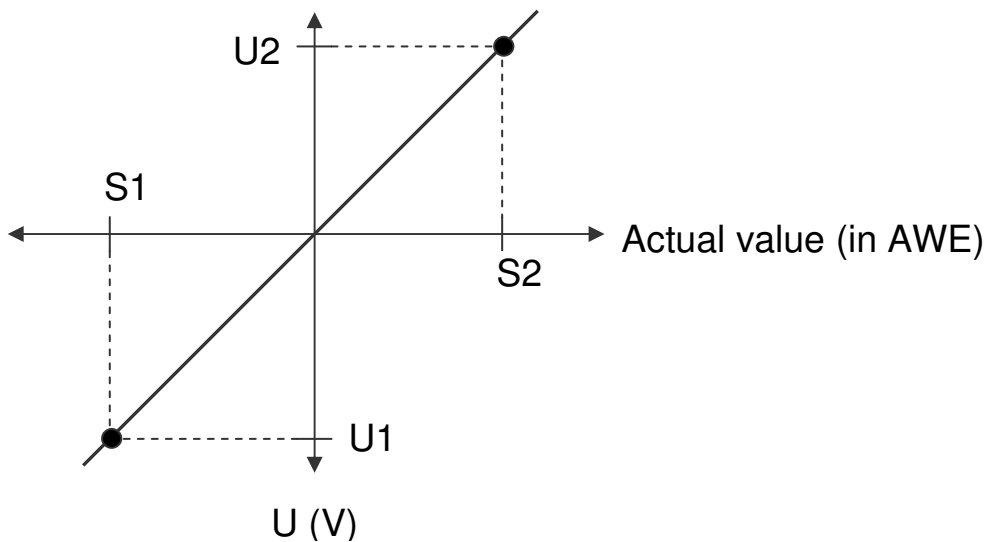
4.1.2 Current input

The current input has a resolution of 610 µA and is programmable through the parameters below.

P[109] = I1 [mA] (input in 0,0001mA units)
P[110] = I2 [mA] (input in 0,0001mA units)
P[111] = S1 in AWE (actual value at I1)
P[112] = S2 in AWE (actual value at I2)
P[104] = measuring time analog
P[225] = integrator analog

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
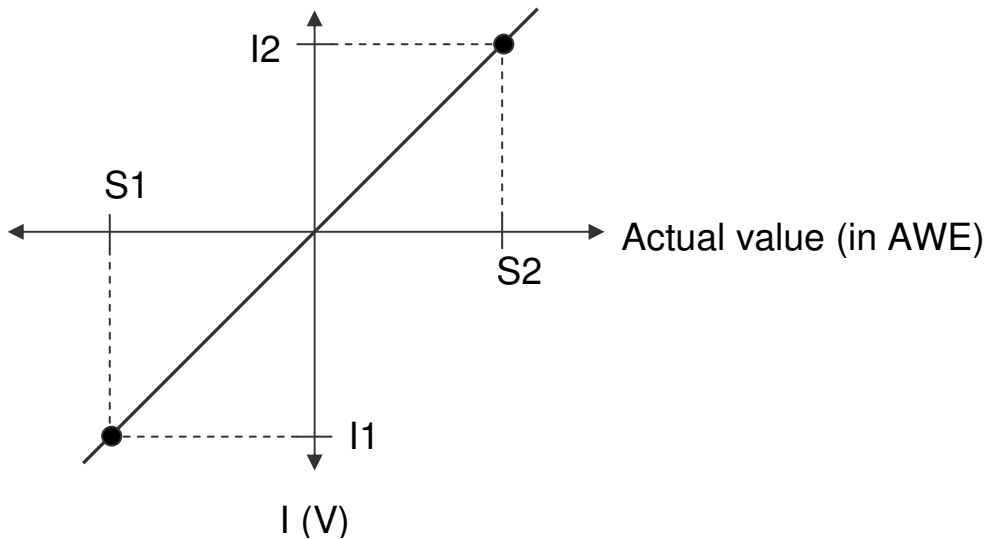
4.2 Velocity measurement

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.

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

4.3 Justage

The justage of absolute sensors can be done in 4 ways:
- Using the parameter "Adjustment absolute value" P[005]
- Using the input input 1 or 2)
- Using parameter service functions P[207]
- Using front keys

4.3.1 Preset using the parameter "Adjustment absolute value"

This function is applicable for absolute sensors and is active when parameter "Adjustment" P[219] has been set to: **"3   PAR"**

Parameter "Adjustment absolute value" P[005] can be set to a value to adjust the encoder. This value (which can be negative and positive) will be added to the actual value and for SSI sensors compensated with the display counting range.

4.3.2 Using the input (input 1 or 2)

In this function the actual position can be preset to a certain value. The function is active when parameter "adjustment" P[219] is set to one of the following options:

option: **"1   L→H Input RAM"**   (rising edge input)
option: **"2   H→L Input RAM"**   (falling edge input)
option: **"4   L→H Input EEPROM"**   (rising edge input)

Parameter "adjustment value" P[005] can be set to a value to which the actual position will be adjusted when input 1 or 2 detects a rising edge, possibly combined with a reference coarse signal ([P213]).
If through parameter [P213] reference coarse has been activated ([P213] <> 0]), the option **"1 – Reference coarse"** should be selected for one of the inputs 1...2 (P[249]...P[250]).
The calculated offset will be stored in either RAM or EEPROM depending on the option chosen in parameter "adjustment" P[219]. When storing into RAM-memory (option 1 and 2) this will occur on a interrupt basis and can be performed during movement. The memory however is volatile and the value will not be permanently stored.

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

Storing the value into EEPROM (option 4) is not initiated by an interrupt. It is recommendable to perform this only when not moving or moving very slow. This value will be stored permanently.

4.3.3   Using service parameter P[207]

When P[207] has the value 111 then the actual position is adjusted to the value of P[005] when the programming mode is left.
After executing this function parameter P[207] will have the value 0 again.

4.3.4 Justage using front keys

The function preset the absolute position can be executed with the key combination [Enter] + [P].
Holding down the [Enter] key and push the [P] key once. Then the actual position is preset to the value of P[005].

This function is active when: P[219] = variant **"5 front keys"**

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

4.4   ASCII protocol

The serial port of the AP22 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.

4.4.1   Overview functions

sc   **Select AP22**
r0   **Read actual position (AWE)**
r1   **Read actual velocity (AWE/s)**
r4   **Read actual voltage analog input (0,1mV eenheden)**
r5   **Read actual current analog input (0,1 mA eenheden)**
r8   **Lezen actuele linearization (AWE)**
ra   **Read actual PeakHold 1**
rb   **Read actual PeakHold 2**
ri   **Read status inputs**
ru   **Read status outputs**
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**
wf   **Reset SSI error**
rn   **Read status bits**
bp   **Load and activate**

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

4.4.2   General

Through the ASCII protocol it is possible to communicate with the AP22.

Send: Data from PC, PLC → AP22

Receive: Data from AP22 → PC, PLC

Connection without EMC bracket

9P sub-D female   Conn.
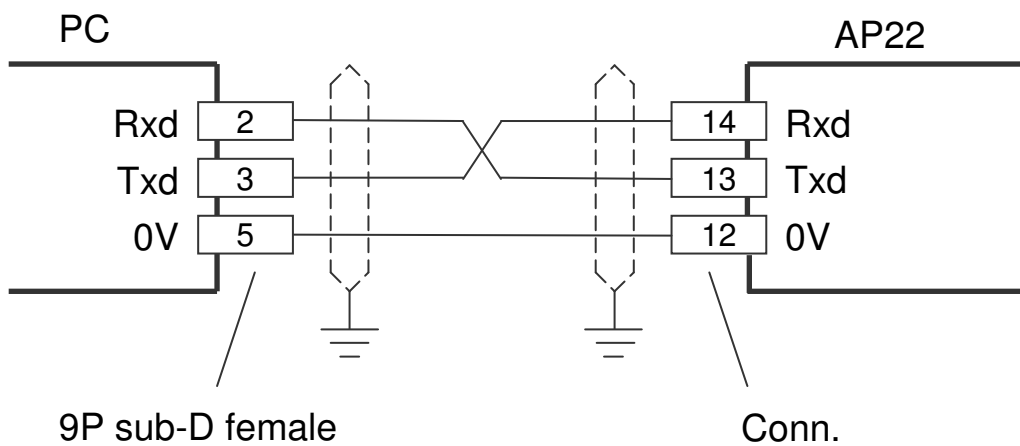
Connection with EMC bracket (EMC-B02)

9P sub-D female   9P sub-D male   Conn.

9P sub-D female
(EMC bracket)

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
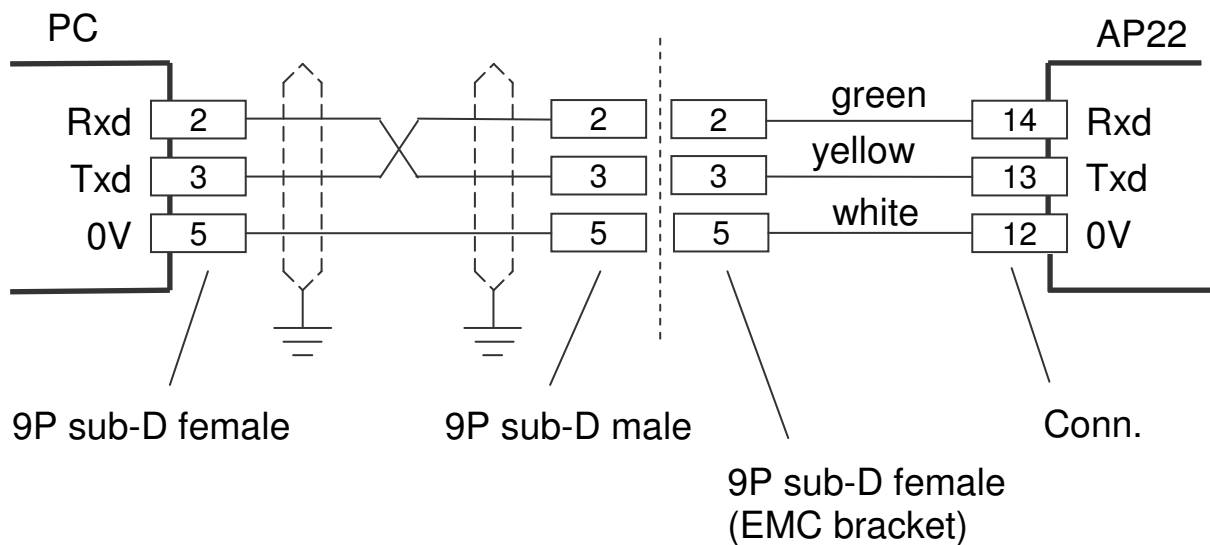
Send structure:
Functioncode (space) [argument 1](space)[argument 2] <CR>

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)*

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

4.4.3   Functions

`sc`   **Select AP22**

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

The AP22 with the unit Id number is selected, all consecutive commands are relevant for this unit.
An AP22 with unit Id number 1 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

`r4`   **Read actual voltage analog input (0,1mV units)**

send:	**`r4`**
receive:	**`r4 xxxxxxxx`**
transmitting parameter:	none

`r5`   **Read actual current analog input (0,1 mA units)**

send:	**`r5`**
receive:	**`r5 xxxxxxxx`**
transmitting parameter:	none

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

r8   Read actual linearization (AWE)

send:	**r8**
receive:	**r8 xxxxxxxx**
transmitting parameter:	none

ra   Read actual PeakHold 1 in (AWE)

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

rb   Read actual PeakHold 2 in (AWE)

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

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"

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

ru   Read status outputs

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

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

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

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

`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

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

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 AP22–D0**
transmitting parameter: none

Example:
send: **rt**
answer: **rt AP22–D0**

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)*

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

wf   Reset SSI error

send: **wf**
receive: **wf**
transmitting parameter: none

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)*

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

4.4.4   Error messages

In case of an error the AP22 will sent 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

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

4.5   Cams

4.5.1   General

The AP22 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 the 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.

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

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

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

Start = 100, end = 200
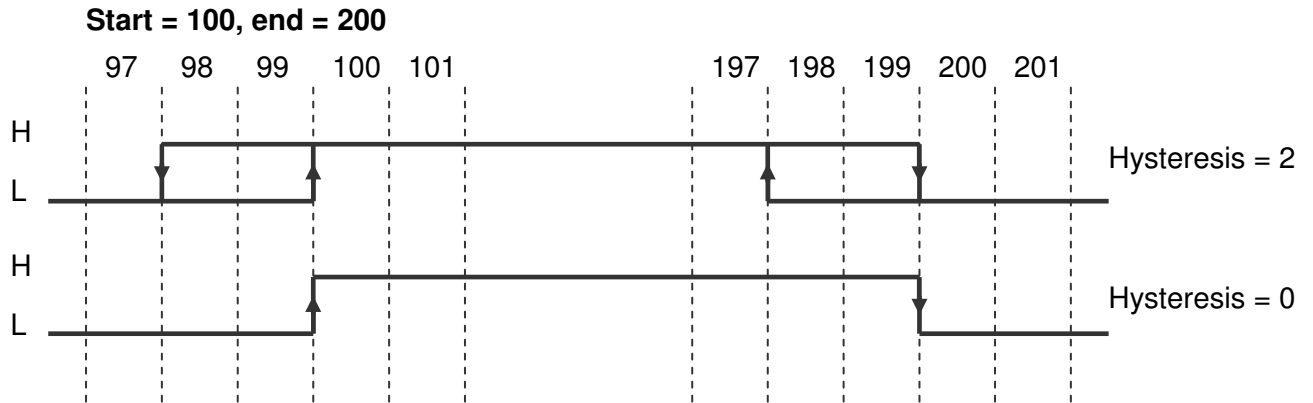
4.5.3 Switching type (2) Greater than or equal to limit value

Only one limit value needs to be programmed.
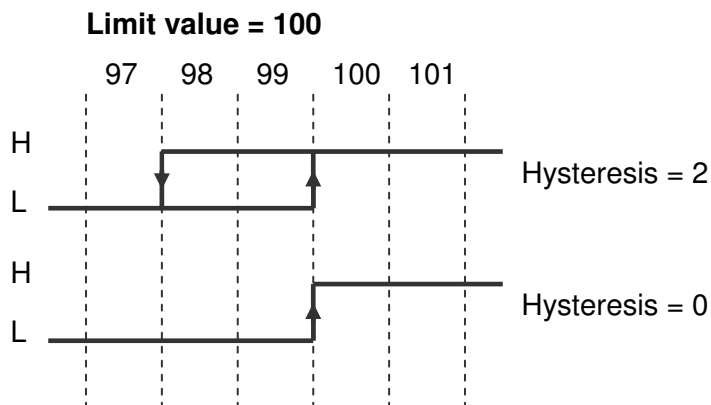
Limit value = 100

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

Only one limit value needs to be programmed.

Limit value = 100

35

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

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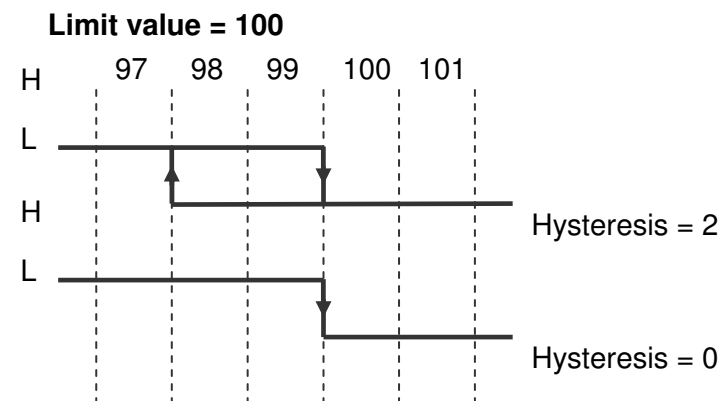
4.5.5 Switching type (4) Greater than or equal to limit value (Timer)

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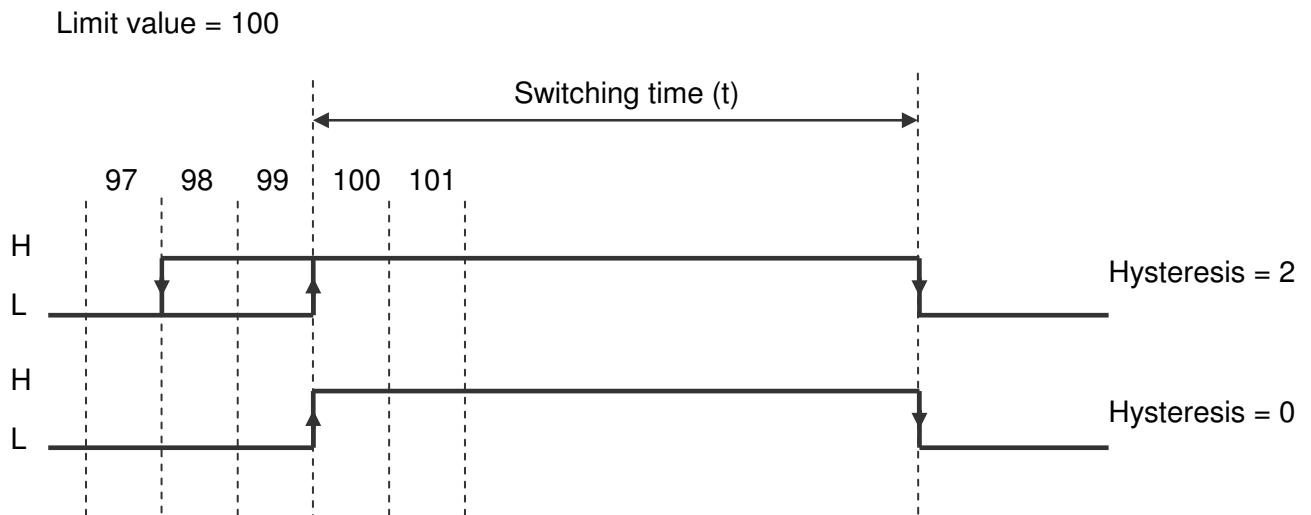
4.5.6 Switching type (5) Smaller than or equal to limit value (Timer)

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.

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
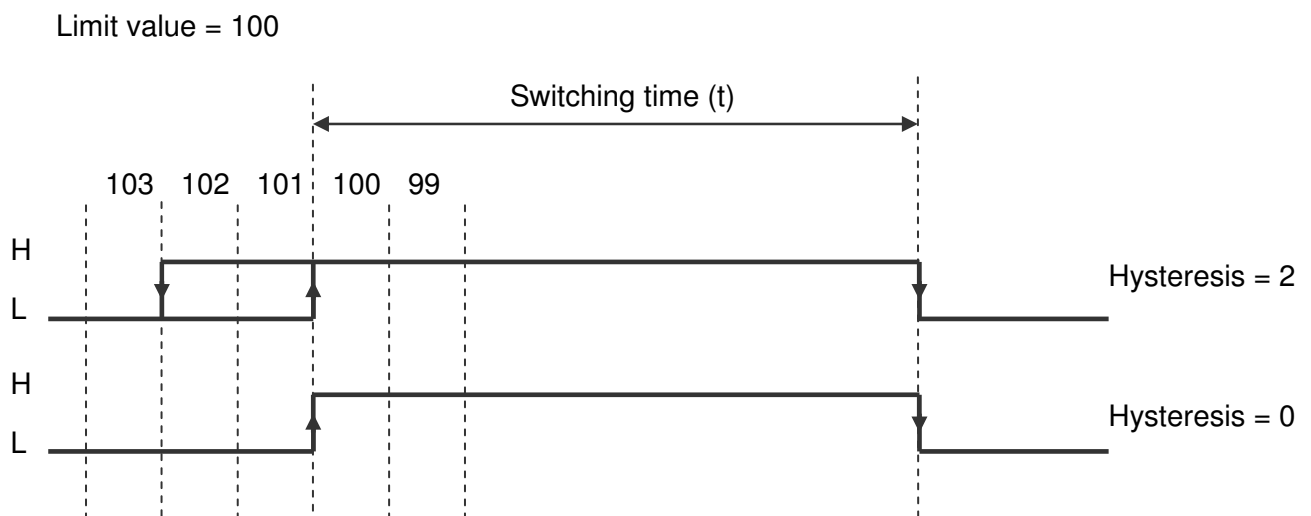
4.5.7 Dynamic cams

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*

Advancement cam

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
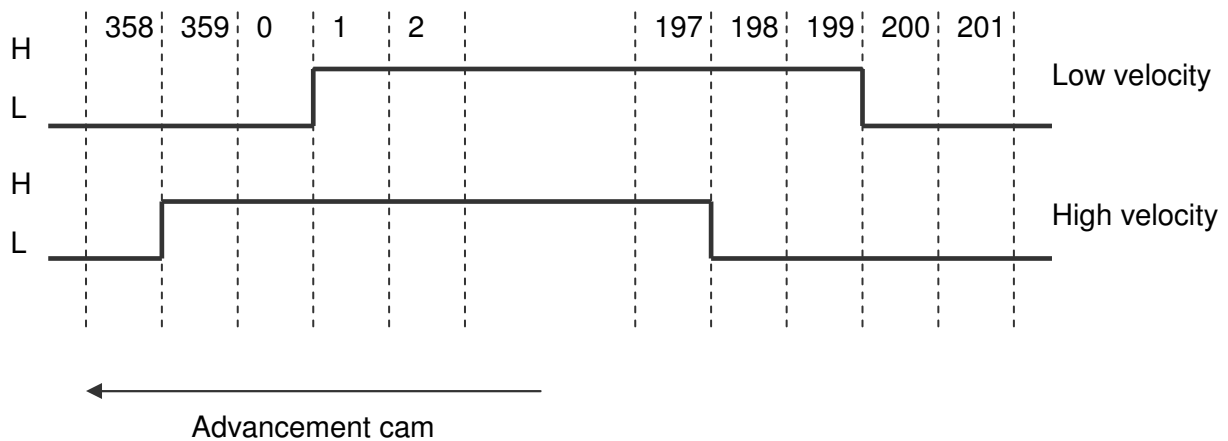
4.5.8   Start/stop cam

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)

4.5.9   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).

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

4.6 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"**

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

4.6.1 mode 0 "4-Quadrant"

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

Condition:
P1-X < P2-X < P3X < … < P30-X)
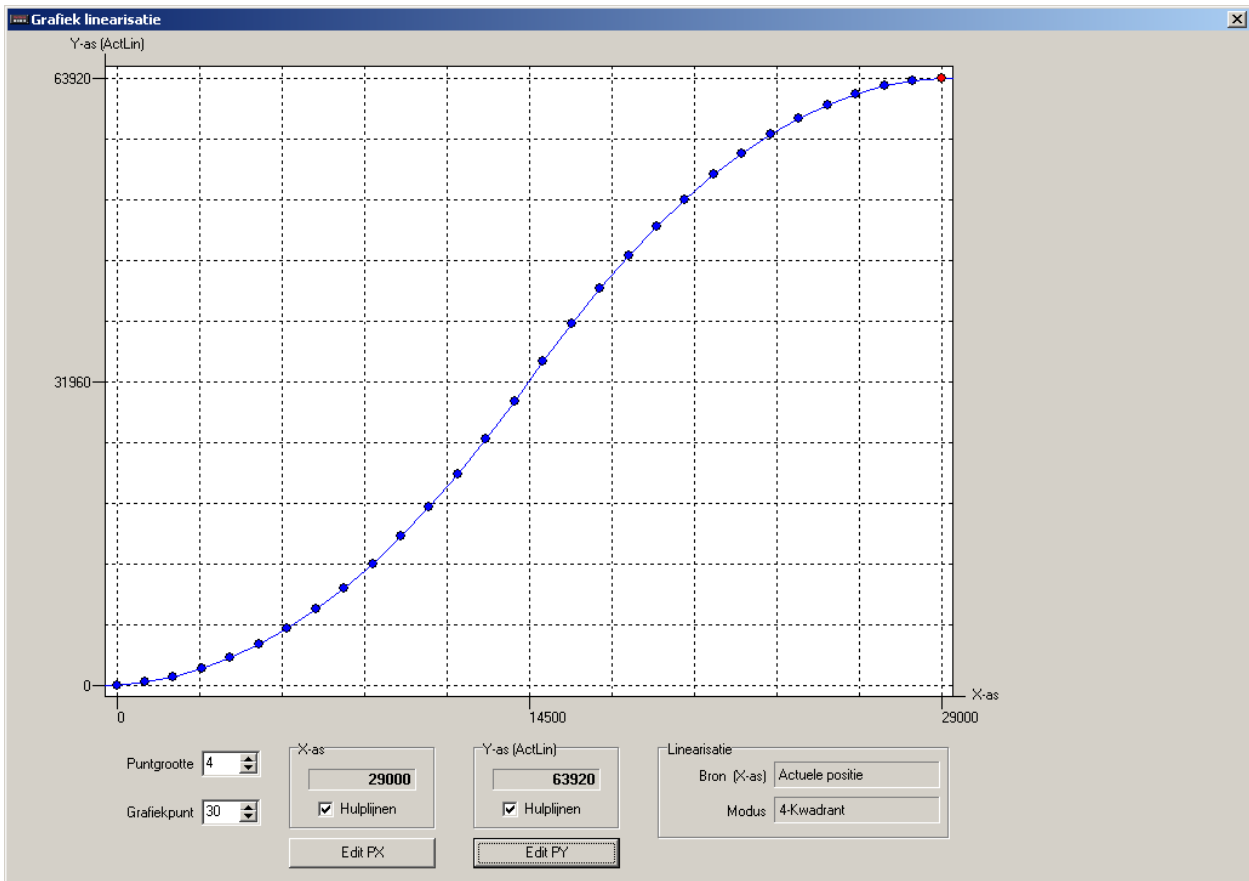
Screenshot from PC programm DST2

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

4.6.2 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.
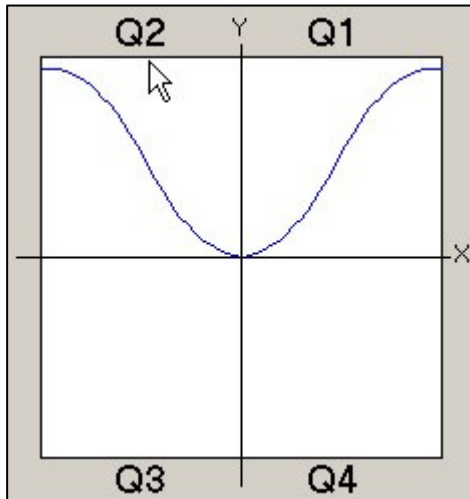
Conditions:
P1-X < P2-X < P3X < … < P30-X)
P1-X = 0

4.6.3 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 < … < P30-X)
P1-X = 0
P1-Y = 0

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
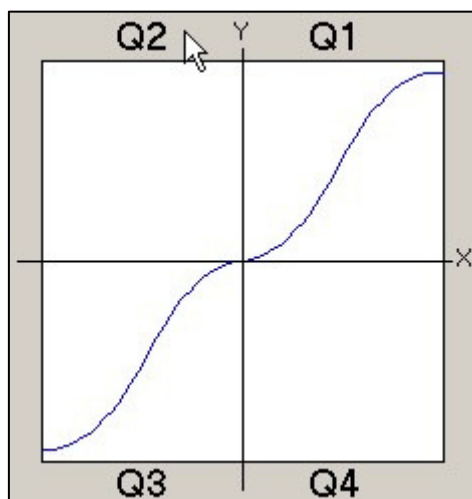
4.7 PeakHold function

4.7.1 general

The PeakHold function can hold the minimum or maximum value of the selected source like actual- position, velocity or linearization.

On power-up or external reset the PeakHold value will be set to the actual value of the selected source.

The PeakHold value can also serve as a source for the cams function.

4.7.2 PeakHold 1

Parameter "Function PeakHold 1" P[242]
option "0 no function"
option "1 detect Peak high"
option "2 detect Peak low"

Parameter "Source PeakHold 1" P[243]
option "0 actual position"
option "1 actual velocity"
option "2 actual lineariaation"

4.7.3 PeakHold 2

Parameter "Function PeakHold 2" P[244]
option "0 no function"
option "1 detect Peak high"
option "2 detect Peak low"

Parameter "Source PeakHold 2" P[245]
option "0 actual position"
option "1 actual velocity"
option "2 actual linearizsation"

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

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		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

PAR: 1.0.6	P[206]	**0** … 1
Power failure protection (only AP20)		
0 = not active		
1 = active		

PAR: 1.0.7	P[207]	**0** … 123
Service functions		
Only possible to activate through keyboard AP22		
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** … 4
Default monitor function		
Determines the default which is visible after start-up.		
0 = Actual position		
1 = Actual velocity		
2 = Actual linearization		
3 = actual PeakHold 1		
4 = actual PeakHold 2		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

5.2 Menu 2 Actual

PAR: 2.3.1	P[005]	-9999999 … **0** … 99999999
Adjustment absolute value		
XXXXXXXX		

PAR: 2.3.2	P[219]	**0** … 5
Adjustment		
0 = no function		
1 = rising edge (input 1 or 2) only temporary in RAM (on interrupt)		
2 = falling edge (input 1 or 2) only temporary in RAM (on interrupt)		
3 = set with parameter adjustment value		
4 = rising edge (input 1 or 2) permanent in EEPROM (not on interrupt)		
5 = front keys		

PAR: 2.3.3	P[213]	**0** … 2
Reference coarse		
0 = no function		
1 = high signal		
2 = low signal		

PAR: 2.3.4	P[227]	**0** … 1
Min/max function		
0 = no function		
1 = min/max		

PAR: 2.3.5	P[113]	-9999999 … **0** … 99999999
Min. Value		
-XXXXXXXX (AWE)		

PAR: 2.3.6	P[114]	-9999999 … **0** … 99999999
Max. value		
-XXXXXXXX (AWE)		

PAR: 2.3.7	P[226]	**0** … 1
Selection AD input		
0 = voltage		
1 = current		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

PAR: 2.3.8	P[104]	0 … 1**0** … 100
Measuring time analog input		
X.XX (sec) input 0 is 1.00s		

PAR: 2.3.9	P[225]	0 … **5** … 50
Integrator analog input		
Actual value is the average from the number of measurements		
0…50 (number of measurements) input 0 = 1		

PAR: 2.3.10	P[105]	**-100000** … 99999
U1 Voltage		
-XX.XXXX (V)		

PAR: 2.3.11	P[106]	-99999 … **100000**
U2 Voltage		
-XX.XXXX (V)		

PAR: 2.2.12	P[107]	-9999999… **-100000** … 99999999
S1 Voltage		
-XXXXXXX (AWE)		

PAR: 2.3.13	P[108]	-9999999 … **100000** … 99999999
S2 Voltage		
-XXXXXXX (AWE)		

PAR: 2.3.14	P[109]	**-200000** … 199999
I1 Current		
-XX.XXXX (mA)		

PAR: 2.3.15	P[110]	-199999 … **200000**
I2 Current		
-XX.XXXX (mA)		

PAR: 2.3.16	P[111]	-9999999… **-200000** … 99999999
S1 Current		
-XXXXXXX (AWE)		

PAR: 1.3.17	P[112]	-9999999 … 2**00000** … 99999999
S2 Current		
-XXXXXXX (AWE)		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

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		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

5.4 Menu 4 Input

INPUT-1

PAR: 4.0.1	P[249]	**0** … 13
Function input-1		
0 = no function 1 = coarse 2 = reference fine 3 = store 4 = error reset SSI 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 13 = reset PeakHold 1/2		

INPUT-2

PAR: 4.0.2	P[250]	**0** … 13
Function input-2		
XX (see input-1)		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

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		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

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** … 4
Source			
0 = actual position			
1 = actual velocity			
2 = actual linearization			
3 = actual PeakHold 1			
4 = actual PeakHold 2			

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		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

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 8 Linearization

5.7.1 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		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

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

5.7.2 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		
-XXXXXXX		

PAR: 8.x.2	P[170]…P[199]	-9999999 … **0** … 99999999
P1-Y		
-XXXXXXX		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

5.8 Menu 9 PeakHold

5.8.1 Submenu 9.1 PeakHold 1

PAR: 9.1.1	P[242]	**0** … 2
Function PeakHold 1		
0 = non function		
1 = detect peak high		
2 = detect peak low		

PAR: 9.1.2	P[243]	**0** … 2
Source PeakHold 1		
0 = actual position		
1 = actual velocity		
2 = actual linearization		

5.8.2 Submenu 9.2 PeakHold 2

PAR: 9.2.1	P[244]	**0** … 2
Function PeakHold 2		
0 = geen functie		
1 = detectie peak high		
2 = detectie peak low		

PAR: 9.2.2	P[245]	**0** … 2
Source PeakHold 2		
0 = actual positie		
1 = actual velocity		
2 = actual linearization		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

5.9 Overview parameters

No	Description	Menu
[000]…[004]	= no function	
[005]	= Adjustment value	2.3.1
[019]	= 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]…[087]	= no function	
[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]…[103]	= no function	
[104]	= Measuring time analog input	2.3.8
[105]	= U1 Voltage	2.3.10
[106]	= U2 Voltage	2.3.11
[107]	= S1 Voltage	2.3.12
[108]	= S2 Voltage	2.3.13
[109]	= I1 Current	2.3.14
[110]	= I2 Current	2.3.15
[111]	= S1 Current	2.3.16
[112]	= S2 Current	2.3.17
[113]	= min. value AD	2.3.5
[114]	= max. value AD	2.3.6
[115]…[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 for justage	2.1.7
[210]	= no function	
[211]	= Counting direction	2.1.2

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

No	Description	Menu
[212] = no function		
[213] = Reference coarse		2.3.3
[214]….[218] = no function		
[219] = Adjustment		2.3.2
[220]…[224] = no function		
[225] = Integrator analog input		2.3.9
[226] = AD function		2.3.7
[227] = min/max function AD		2.3.4
[228]…[235] = no function		
[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] = Function PeakHold 1		9.1.1
[243] = Source PeakHold 1		9.1.2
[244] = Function PeakHold 2		9.2.1
[245] = Source PeakHold 2		9.2.2
[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		

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

6   Connections
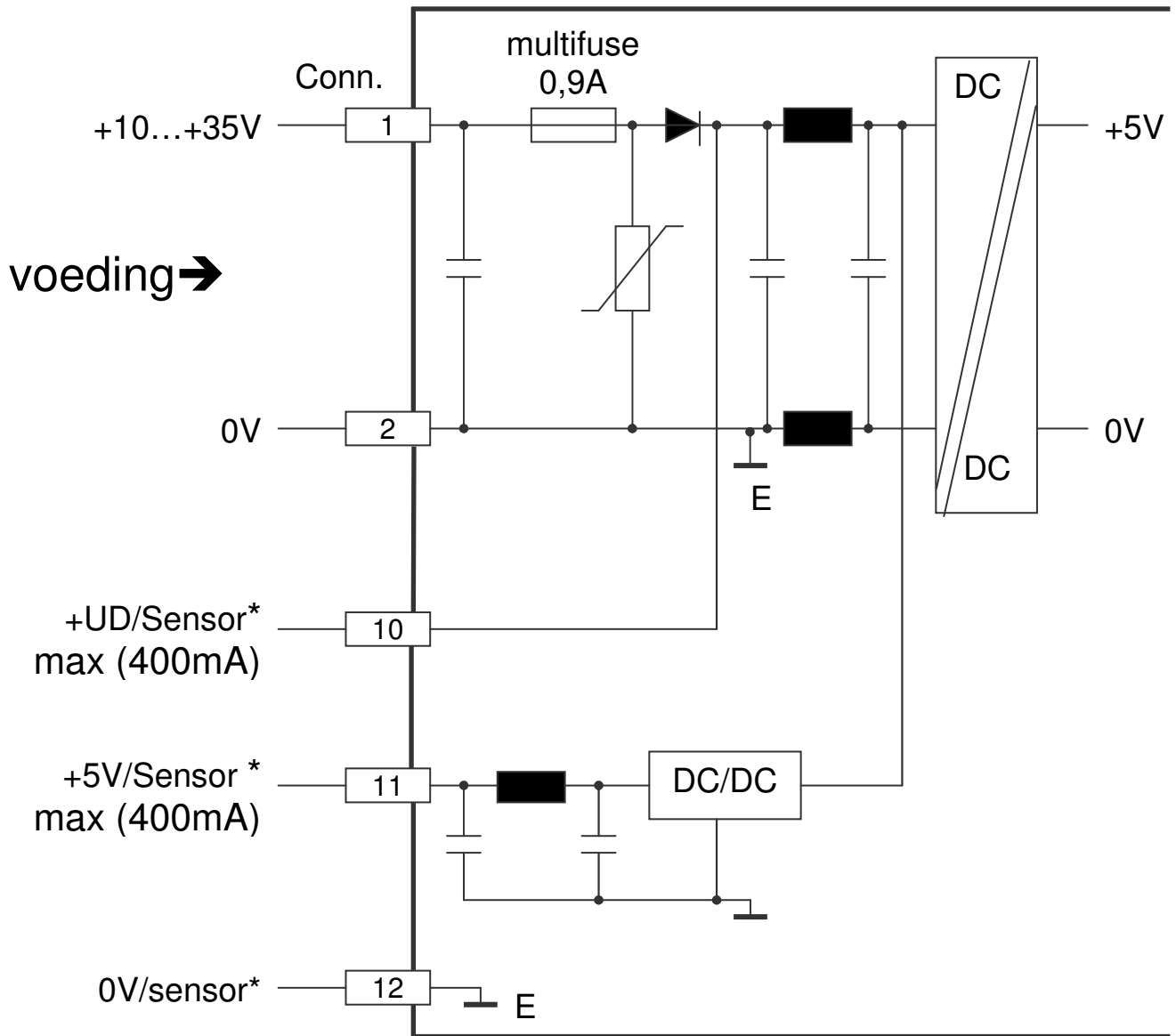
Connections on the rear
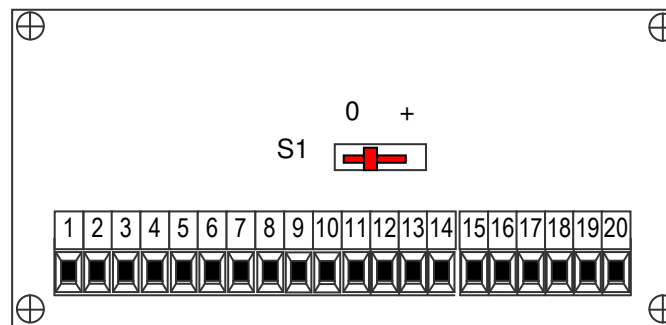
6.1 Overview clamp connections

1.   +10…+35V supply
2.   0V supply
3.   K1 (geen functie)
4.   /K1 (geen functie
5.   Analoog+
6.   Analoog-
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

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

6.2 Supply

voeding➜

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

6.3   Analog input

6.4   Digital inputs

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.
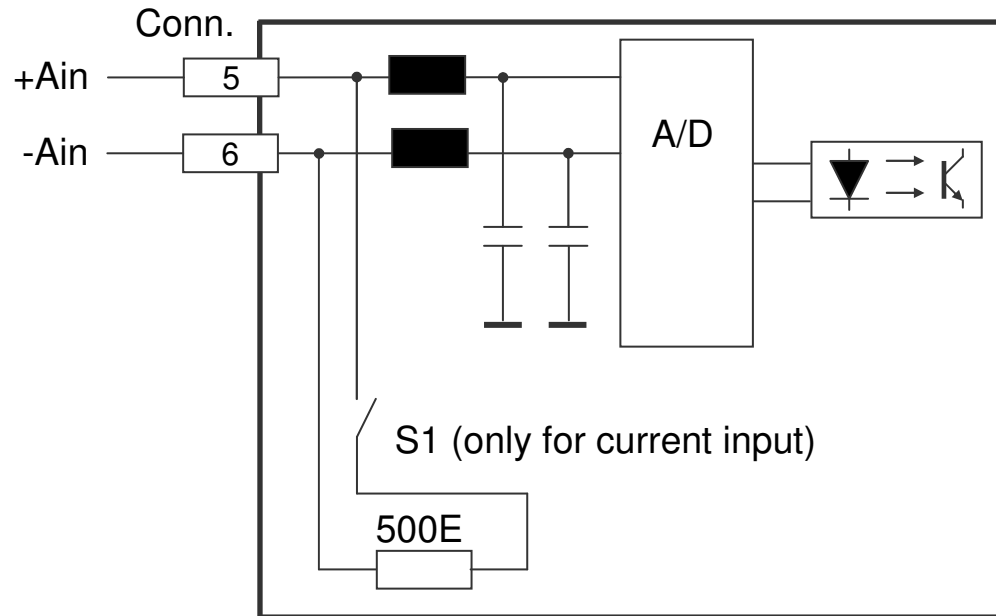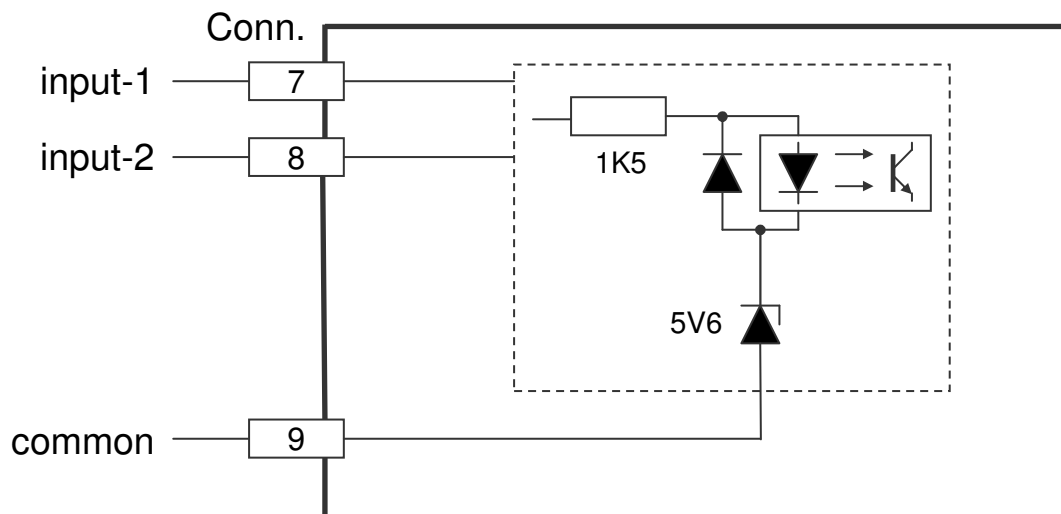
6.5   Digital outputs

6.6   RS232

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
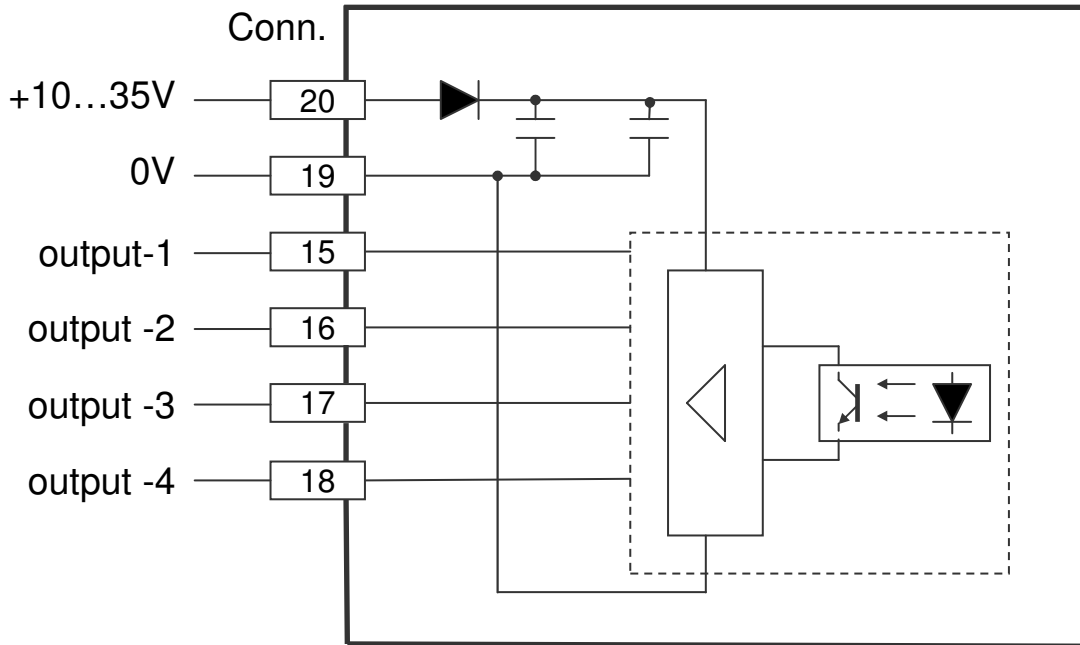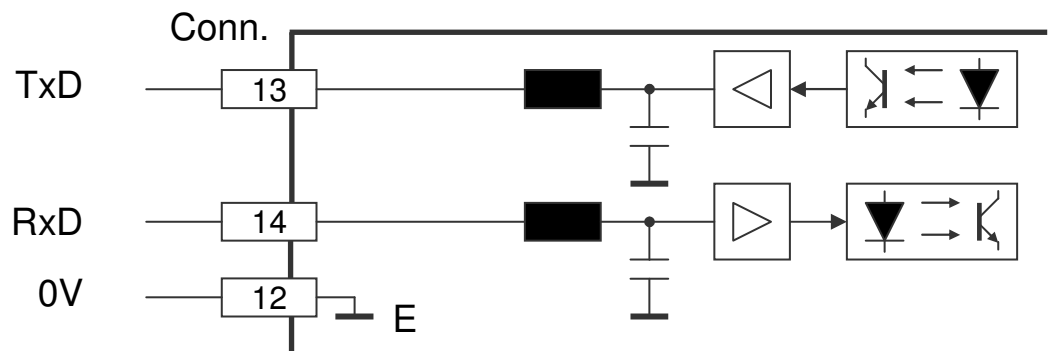
7   Technical specifications

7.1 Specifications

- Supply voltage   10…35V DC
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

- Digital inputs 1…2   optically isolated
                                low: 0…+5V
                                high: +10V…+35V

  input resistor   appr. 1.8kOhm at 24V

- Digital outputs 1…4   optically isolated, N FET, short-circuit proof
    Imax   500 mA (min load 200 µA)
    Supply voltage   35V max.

- Voltage input   galvanically isolated
    range   max. −10V … +10V
    resolution   305 µV
    offset-temp. coeff.   < 20 ppm/ ℃
    Rin   30 Kohm

- Current input   galvanically isolated
    range   max. −20mA … +20mA
    resolution   610 µA
    offset-temp. coeff.   < 20 ppm/ ℃
    Rin   500 Ohm
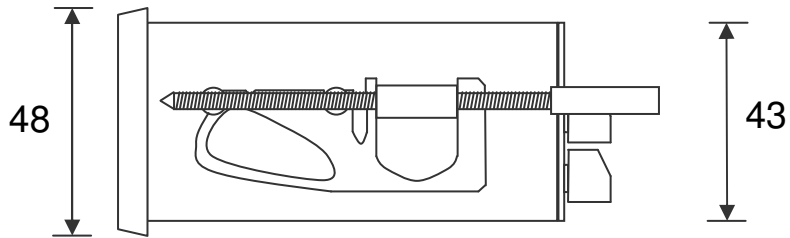
- Serial communication   RS232 C

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

- Display   8 decades 7-segments LED
  - digit height   14 mm

- Temperature range   0…50°C

- Connection diameter   1,6 mm² (raster 3,81mm)

- Electromagnetic   in accordance with guideline
  - compatibility   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

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

7.2 Typekey

AP22- X 0

Digital outputs
0 = no digital outputs
D = 4 digital outputs

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON

7.3   Dimensions AP22

Side view

Top view

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
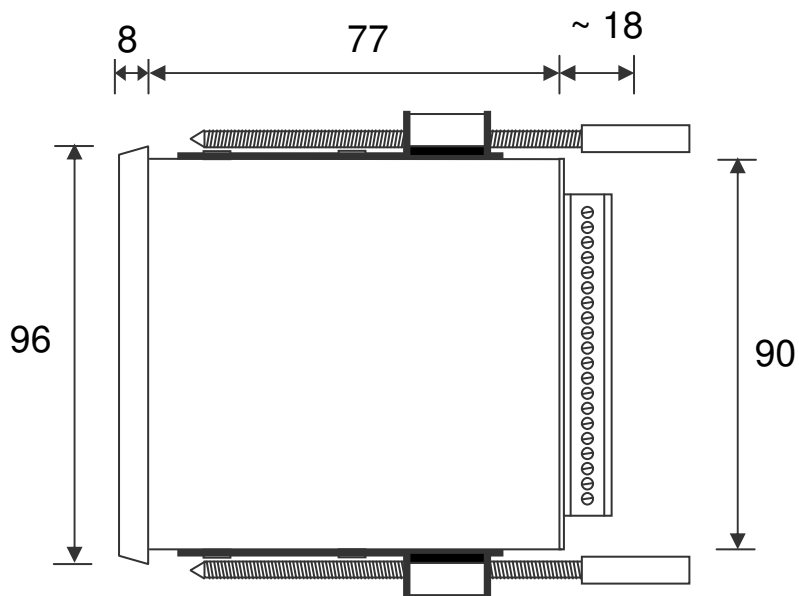
7.4 Dimensions EMC bracket type EMC-B02

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

90

2

65

M5

9P sub-D
female

32
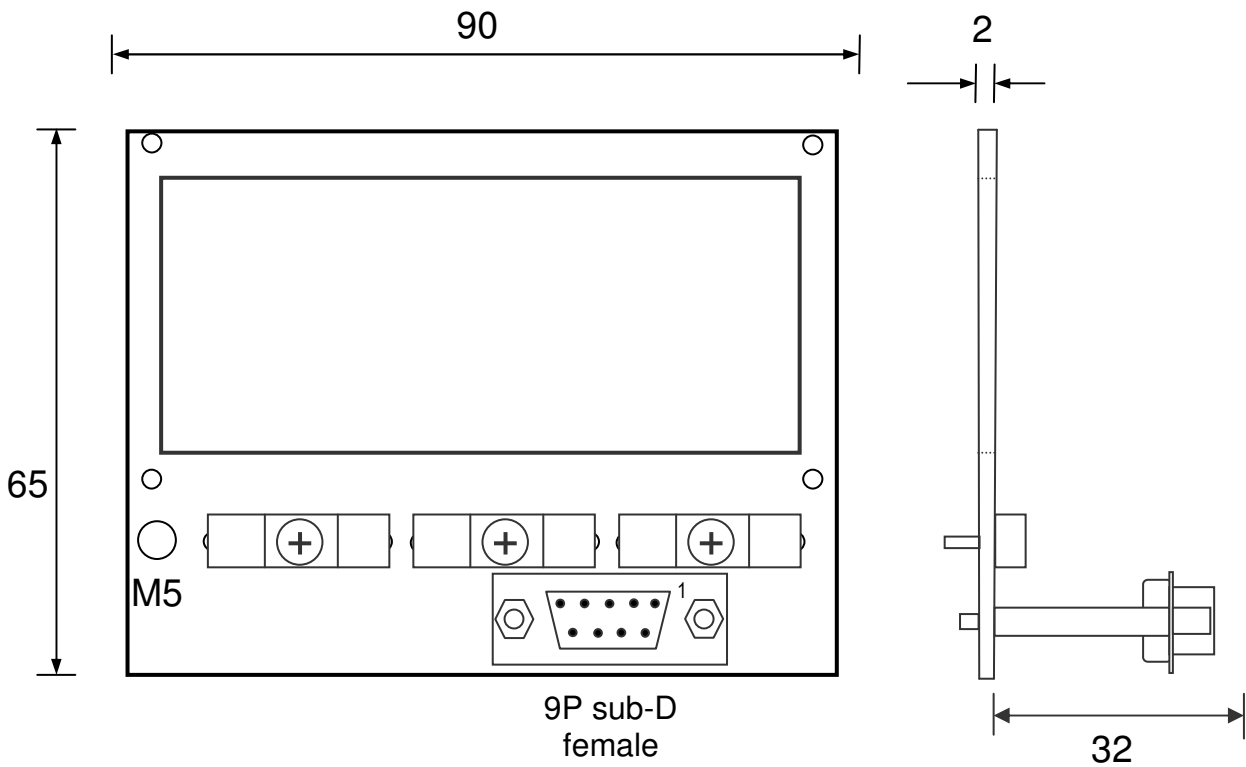
Side view with EMC bracket

48

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
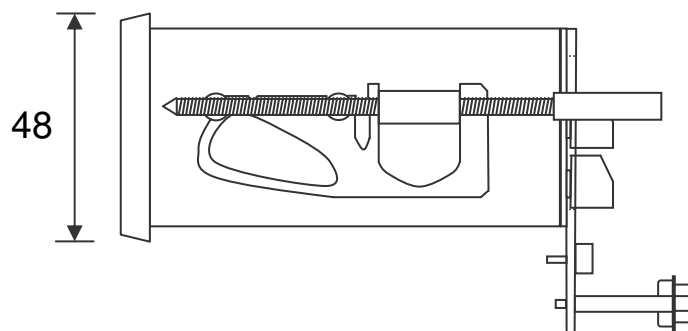
7.4.1 Connections RS232 on 9P sub-D connector

```
9P sub-D
 female                                            AP22

                          wit
       0V  │ 5 ├──────────────────────┤ 12 │ 0V
                          geel
      TxD  │ 3 ├──────────────────────┤ 13 │ TxD
                          groen
      RxD  │ 2 ├──────────────────────┤ 14 │ RxD
```

Manual AP22 Analog Display

2019 V01. For software version V2.04. Subject to change without notice.

DIEGON
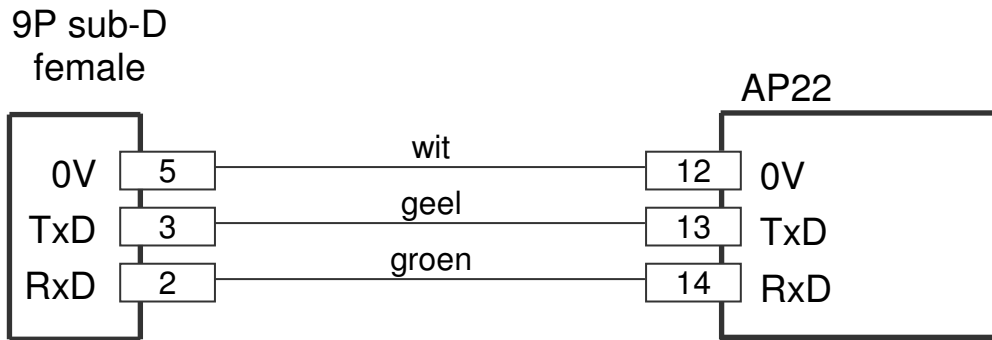
7.5 Dimensions protective hood type CDS-B02

34   32

51

99