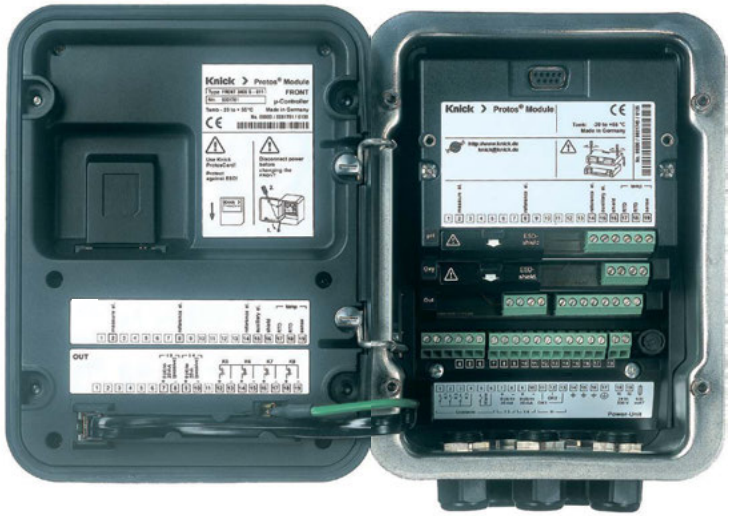
Knick

Protos II 4400(X) / Protos 3400(X) Process Analysis System

User Manual

Protos PID 3400(X)-121 Communication Module
PID Controller Module with 2 Current Outputs and 4 Relay Outputs



Latest Product Information: www.knick.de

Returns

Please contact our Service Team before returning a defective device. Ship the cleaned device to the address you have been given.
If the device has been in contact with process medium, it must be decontaminated/disinfected before shipment. In this case, place a Declaration of Contamination in the consignment to prevent any risk to the health and safety of our service personnel. The declaration is available at:

https://www.knick-international.com/en/service/repairs/

Disposal

Please observe the applicable local or national regulations concerning the disposal of "waste electrical and electronic equipment".

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Intended Use

The module is a general-purpose PID controller module. Analog control valves are actuated via 2 passive current outputs. Digital straightway valves are actuated via 2 relay contacts. In addition, two relay contacts are provided for limit monitoring or pre-control.

The PID 3400X-121 module is intended for operation in locations subject to explosion hazards which require equipment of Group II, device category 2(1), gas/dust.

Operation in Explosive Atmospheres: PID 3400X-121 Module
The module is approved for operation in explosive atmospheres.
When installing the product in a hazardous location, observe the information in the supplements to the certificates and, if applicable, the relevant control drawings.
Observe all applicable local and national codes and standards for the installation of electrical equipment in explosive atmospheres. For orientation, please refer to IEC 60079-14, EU directives 2014/34/EU and 1999/92/EC (ATEX), NFPA 70 (NEC), ANSI/ISA-RP12.06.01.

⚠ **WARNING!** Risk of impairment of explosion protection.

- Modules which have already been used shall be subjected to a professional routine test before they may be operated in another type of protection.
- Prior to commissioning, the operating company must verify the intrinsic safety in accordance with the installation regulations of IEC 60079-14 for the complete interconnection of all equipment involved, including the connecting cables.
- The interconnection of Ex and non-Ex modules (mixed assembly) is not permitted.
- In hazardous locations the device shall only be cleaned with a damp cloth to prevent electrostatic charging.

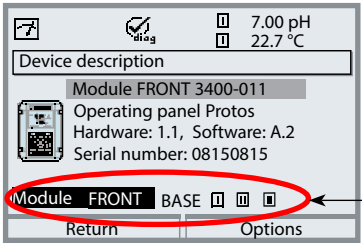
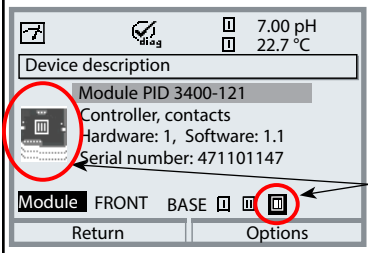
Maintenance
The Protos modules cannot be repaired by the user. For inquiries regarding module repair, please contact Knick Elektronische Messgeräte GmbH & Co. KG at www.knick.de.

Firmware Version

Module Firmware PID 3400(X)-121: firmware version 1.x

Module Compatibility	PID 3400-121	PID 3400X-121
Protos 3400 from FRONT firmware version 1.0	x	
Protos 3400X from FRONT firmware version 4.0[1)]		x
Protos II 4400 from FRONT firmware version 1.0.0	x	
Protos II 4400X from FRONT firmware version 1.0.0		x

Query actual device/module software
When the analyzer is in measuring mode:
Press **menu** key, open Diagnostics menu: Device description

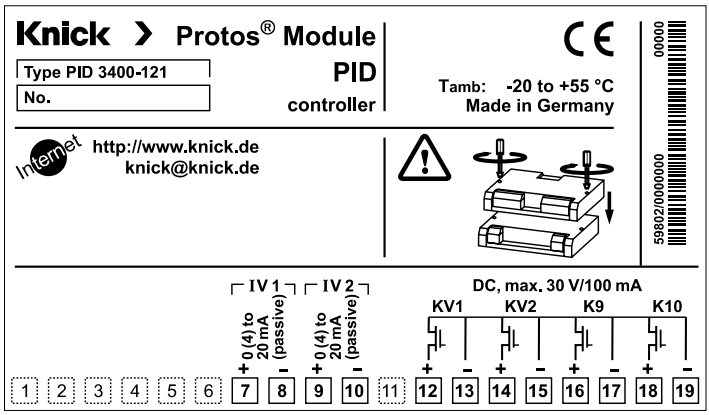
Menu	Display	Device description
diag		**Device hardware and firmware version** Provides information on all modules installed: Module type and function, serial number, hardware and firmware version and device options. Select the different modules (FRONT, BASE, slots 1 - 3) using the arrow keys.
		**Query module firmware** Module PID 3400-121, hardware and firmware version, serial number – here installed in slot 3.

Note: The display may vary depending on the device version.

1) From FRONT firmware version 8.x an additional PI controller with vertex points can be configured.

Terminal Plate

Terminal Plate PID 3400-121 Module



Attaching the Terminal Plates

The terminal plates of the lower modules can be sticked to the inner side of the door. This facilitates maintenance and service.

Installing the Module

⚠ **CAUTION!** Electrostatic discharge (ESD).
The modules' signal inputs are sensitive to electrostatic discharge.
Take measures to protect against ESD before inserting the module and wiring the inputs.

Note: Strip the insulation from the wires using a suitable tool to prevent damage.

1) Switch off the power supply to the device.
2) Open the device (loosen the 4 screws on the front).
3) Plug the module into the slot (D-SUB connector), see figure on the right.
4) Tighten the module's fastening screws.
5) Connect the signal lines, see "Wiring" on the next page.
6) Check whether all connections are correctly wired.
7) Close the device by tightening the screws on the front.
8) Switch on the power supply.

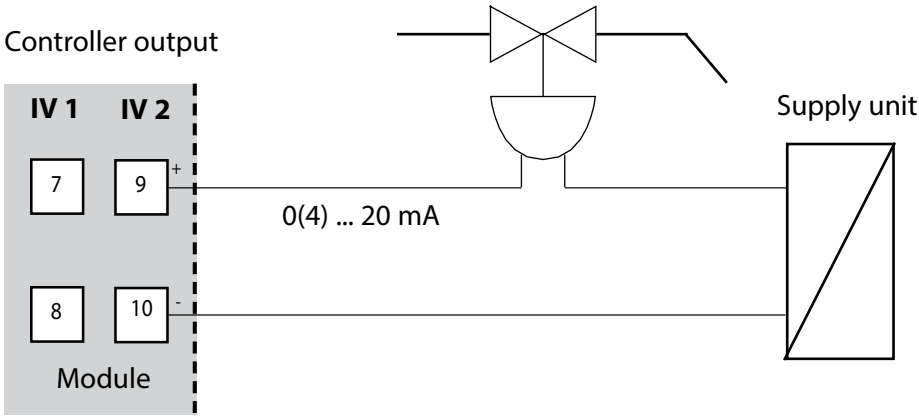
⚠ **CAUTION!** Incorrect measurement results.
Incorrect parameter setting, calibration or adjustment may result in incorrect measurements being recorded. Protos must therefore be commissioned by a system specialist, all its parameters must be set, and it must be fully adjusted.

Wiring Examples

Analog and Digital Controller Outputs

Wiring Example 1

Analog controller outputs IV 1, IV 2 (passive, supply unit required)



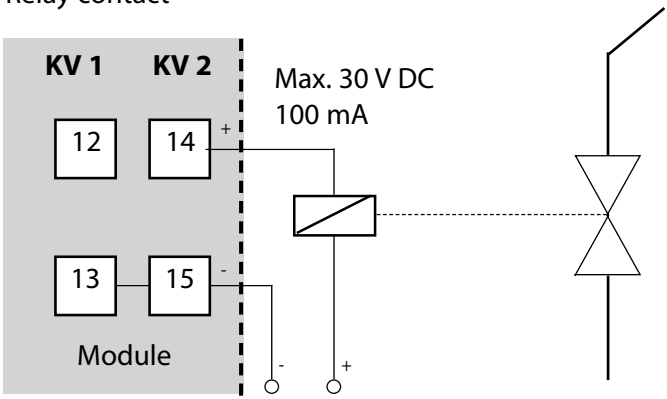
Wiring Examples

Relay Contacts

Wiring Example 2

Digital controller outputs KV 1, KV 2 (electronic relay contacts)

Relay contact

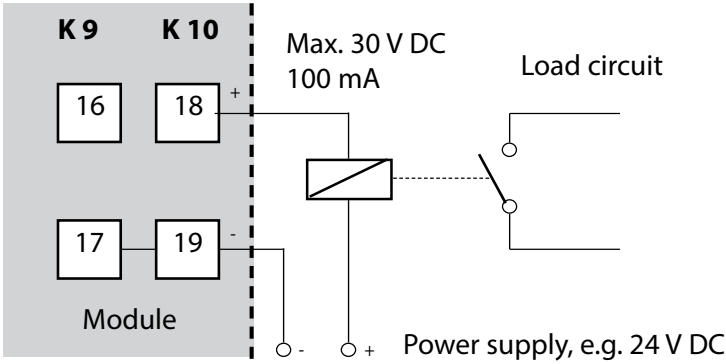


Power supply, e.g. 24 V DC

Wiring Example 3

Electronic relay contacts K 9, K 10

Limit contact



PID Controller

Short Introduction

PID control requires a closed loop. The control loop is made up of individual components which must be in permanent operation. The process variable to be controlled (controlled variable) is continuously measured and compared with the desired value (setpoint). The aim is to keep the controlled variable at the setpoint.

The controlled variables (e.g. pressure, temperature, pH value, concentration, ...) are measured using suitable sensors which provide the continuously measured values for comparison with the setpoint. The comparison intervals can be selected as desired. Deviations trigger a control procedure with the aim to adjust the controlled variable to the setpoint within a preset time.

This comparison procedure and the calculation of the required change of the controlled variable is performed by the controller.

Controllers are classified according to their characteristic, dynamic response, and mode of operation.

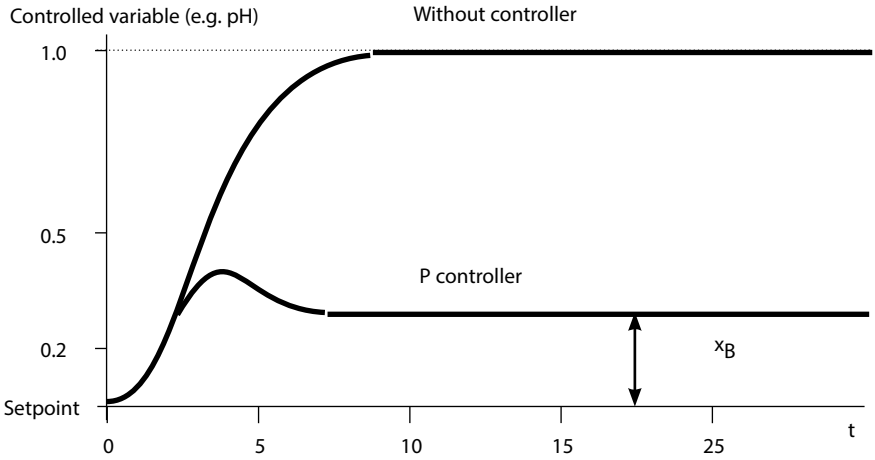
- Characteristic
  A distinction is made between continuous (linear) and discontinuous controllers.

- Dynamic response:
  A change in the error variable at the controller input influences the manipulated variable at the controller output.

There is a great variety of classification criteria for linear controllers. Particular importance must be placed on their dynamic response, however. The following text describes the components of dynamic action and their typical combinations.

P Controller (Parameter: Controller Gain)

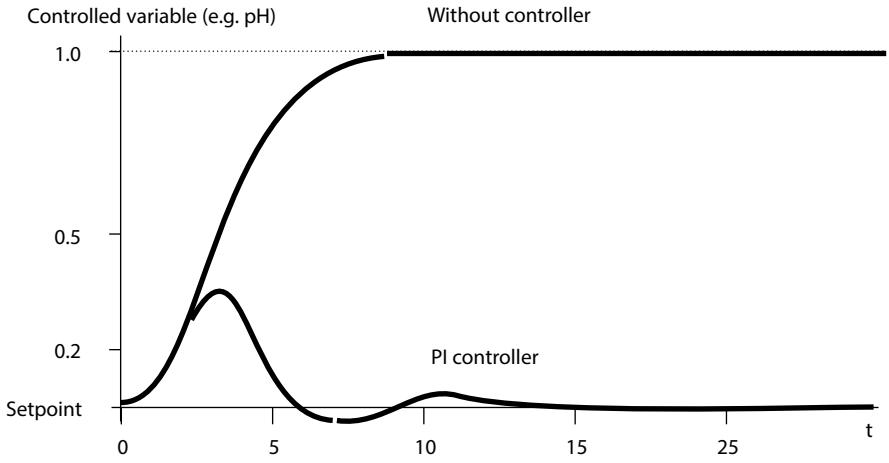
The proportional-action component of a P controller transforms the control deviation (error variable) to a proportional controller output (manipulated variable). The range of the manipulated variable is limited. Therefore, also the usable range of the controller input signal (control range) is limited.



Schematic diagram of P controller
Time response of control as reaction to a disturbance:
After a short settling time a deviation x_B remains.
The desired value is not reached.

I Controller (Parameter: Reset Time)
The integral-action component takes account of the rate of change of the manipulated variable, i.e. it forms the time integral of the error variable. Each value of the controlled variable is assigned to a particular rate of change of the manipulated variable.

PI Controller
These controllers combine proportional and integral action. Compared to P controllers, which only provide a proportional relationship between controlled variable and manipulated variable, here an integration over time is also performed.
First, the value of the manipulated variable is calculated in proportion to the error variable, and then the integral-action component is added.

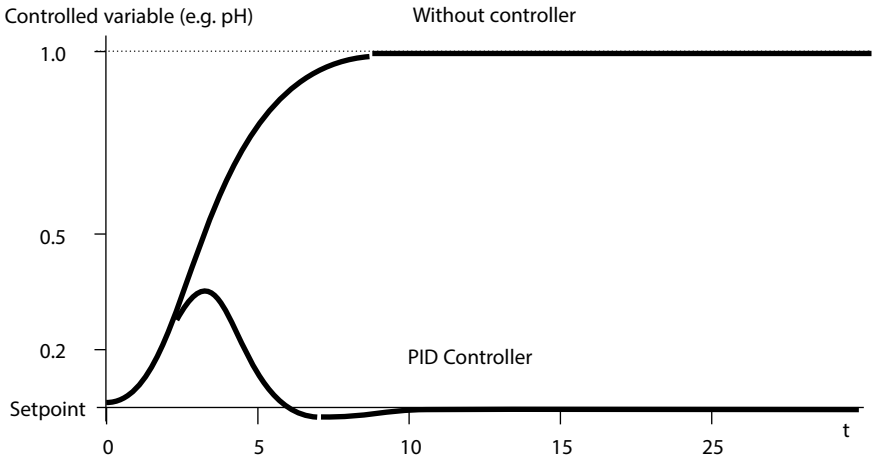


Schematic diagram of PI controller
Time response of control as reaction to a disturbance.
The desired value is reached after several oscillations.

D Control (Parameter: Derivative)
A derivative control alone is completely unsuitable since it only reacts to changes of the error variable, that is, constant errors remain unnoticed.

PD Controller
This controller adds the proportional change of the input signal and the rate of change of the controlled variable to the resulting manipulated variable.

PID Controller
This controller comprises the P, I, and D components of linear controllers. The manipulated variable of a PID control system is the sum of the output variables of a P, an I, and a D control system.



Schematic diagram of PID controller
Time response of control as reaction to a disturbance.
The desired value is reached after a short overshoot.

PID Controller

Short Introduction

The maximum overshoot of the PID controller is even smaller than that of the PD controller. Due to its I-action component there is no remaining offset. However, the components (P, I, D) of a PID controller implement a universally applicable, classical controller thanks to the fast reaction of the P component, the regulating capacity of the I component, and the attenuating effect of the D component.

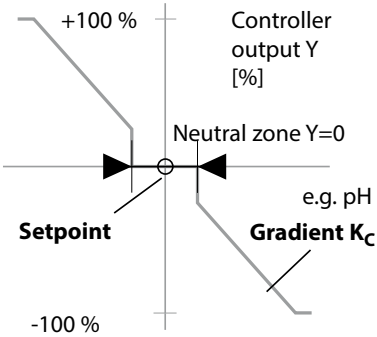
Typical Applications

P Controller
Application for integrating control systems (e.g. closed tank, batch processes).

PI Controller
Application for non-integrating control systems (e.g. drains).

PID Controller
The additional derivative action compensates for measurement peaks.

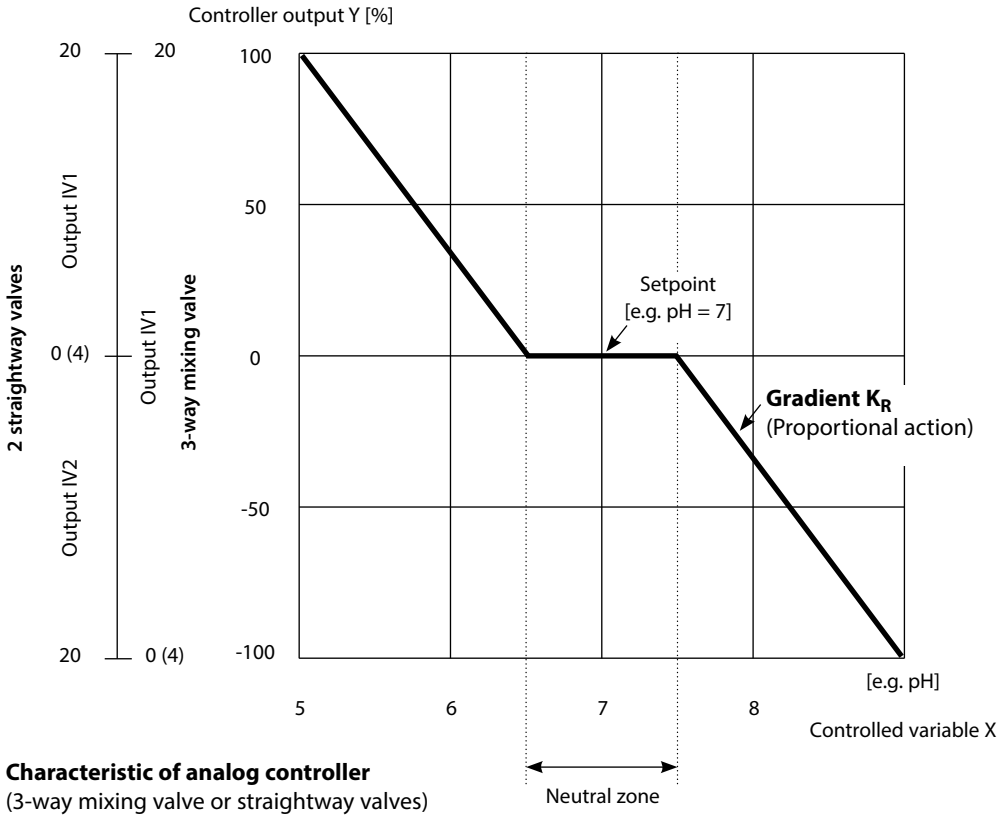
Controller characteristic



Analog Controller IV1/IV2

The following controller characteristics can be defined:

- Values are adjusted toward the setpoint.
- In the neutral zone (symmetrical to setpoint) no control takes place.
- Controller parameters: Controller gain, reset, and derivative.
- Feed time alarm: determines how long the controller output may be at maximum until an alarm is released. This allows recognition of a defective valve or an error in the process.
- Behavior during HOLD:
  User-defined Constant controller output ("last usable value")
  Controller output = 0 (controller switched off)

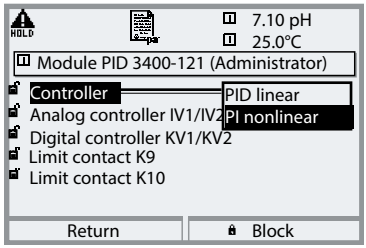


Characteristic of analog controller
(3-way mixing valve or straightway valves)

Nonlinear PI Controller

Analog Controller IV1/IV2

PI Controller with Vertices (Analog Controller IV1/IV2)
For control of pH neutralization processes, a nonlinear controller (controller with vertices) often provides better results since the control curve can be better adapted to a titration curve.
The PID 3400(X)-121 controller module provides an additional nonlinear PI controller. Selection is made in the initial menu. With the "PI nonlinear" controller, you can specify a vertex for each control section using X/Y coordinates.



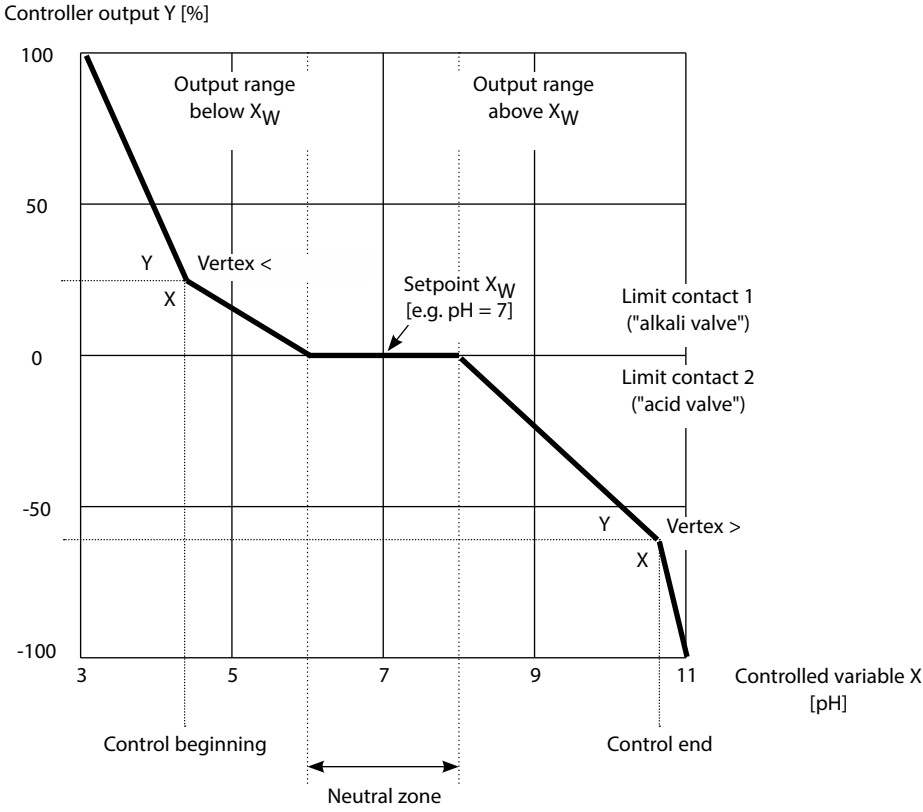
The nonlinear PI controller with vertices is selected in the menu

Parameter setting /
Module PID 3400-121
The following parameters can be set:

- Controller type
- Controlled variable
- Setpoint
- Neutral zone
- < Control beginning
- < Vertex X
- < Vertex Y
- > Control end
- > Vertex X
- > Vertex Y
- (I) Reset time
- Feed time alarm after
- Behavior during HOLD
- Output IV1/IV2

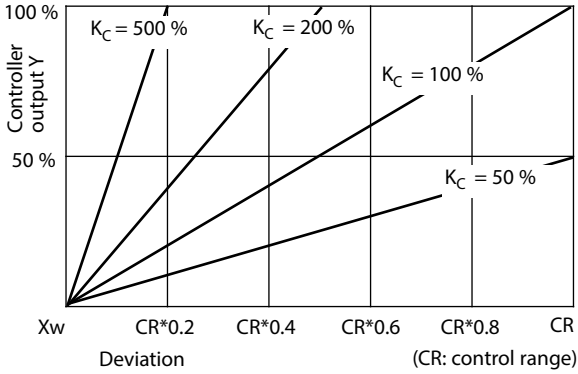
Characteristic of Nonlinear PI Controller

Analog Controller IV1/IV2



Controller characteristic of PI controller with vertices

Proportional Action (Gradient K_C [%])

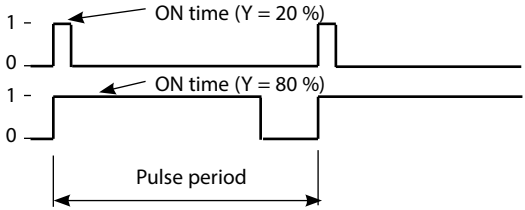


Variable	Control range CR
pH	5
ORP	500 mV
$\%O_2$	50 %
%Air	50 %
mg/l	5 mg/l
S/cm	5 mS/cm
°C	50 K
%vol	50 %
ppm	5000 (oxygen in gases)

Pulse Length Controller

The pulse length controller is used to operate a valve as an actuator.
It switches the contact on for a time that depends on the controller output (Y).
The period is constant. A minimum ON time of 0.5 sec is maintained even if the controller output takes corresponding values.

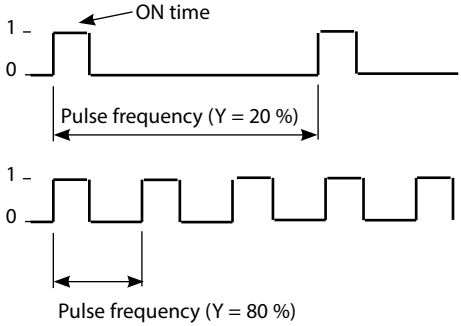
Output signal (switching contact) of pulse length controller



Pulse Frequency Controller

The pulse frequency controller is used to operate a frequency-controlled actuator (metering pump). It varies the frequency with which the contacts are switched on. The maximum pulse frequency [pulses/min] can be defined.
It depends on the actuator. The contact ON time is constant.
It is automatically calculated from the user-defined maximum pulse frequency:

Output signal (relay contact) of pulse frequency controller



PID Controller and Limit Contacts

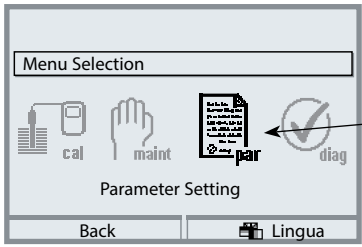
User-defined variables

Measuring module (measured variable)	Controller	Limit value
PH (depending on model)	pH, ORP, °C	pH, ORP, °C, rH
COND	S/cm, °C	S/cm, % by wt, °C, g/kg, Ω*cm
CONDI	S/cm, °C	S/cm, % by wt, °C, g/kg, Ω*cm
OXY	%Air, %O_2, °C, mg/l %vol	%Air, %O_2, mbar, nA, °C, mg/l Partial pressure (mbar) %vol (O_2 measurement in gases) ppm (gas)
Calculation Blocks		Process variables as configured

Parameter Setting

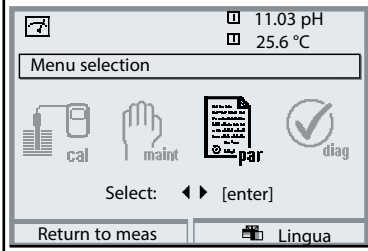
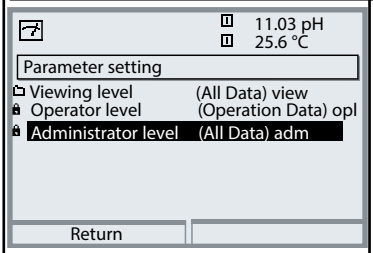
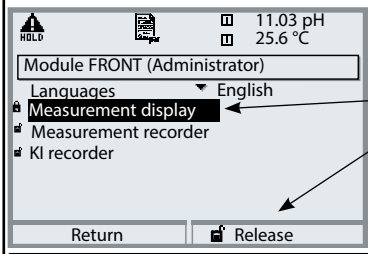
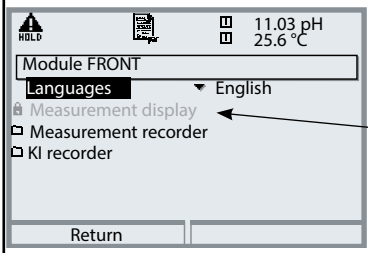
⚠ CAUTION!
Incorrect parameter setting, calibration or adjustment may result in incorrect measurements being recorded. Protos must therefore be commissioned by a system specialist, all its parameters must be set, and it must be fully adjusted.

NOTICE!
The "function check" (HOLD) mode is active during parameter setting.
The behavior of the current outputs depends on the parameter setting, i.e., they may be frozen at the last measurement or set to a fixed value. The red "Alarm" LED blinks.
Measurement operations must not be carried out while the Protos is in the function check (HOLD) mode, as this may put the user at risk due to unexpected system behavior.

Menü	Display	Aktion
		**Open the Parameter Setting menu** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, press **enter** to confirm

Parameter Setting: Operating Levels

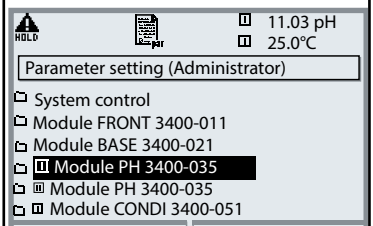
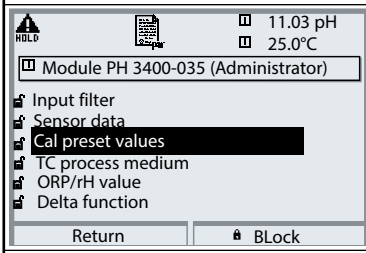
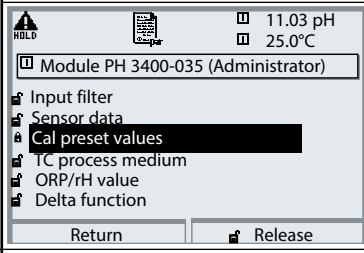
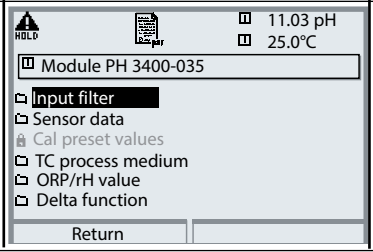
Viewing level, Operator level, Administrator level
Note: Function check (HOLD) mode active (Setting: BASE module)

Menu	Display	Viewing level, Operator level, Administrator level
par		**Open parameter setting** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, press **enter** to confirm.
		**Administrator level** Access to all functions, also passcode setting. Releasing or blocking a function for access from the Operator level.
		Functions which can be blocked for the Operator level are marked with the "lock" symbol. The functions are released or blocked using the softkey.
		**Operator level** Access to all functions which have been released at the Administrator level. Blocked functions are displayed in gray and cannot be edited (Fig.). **Viewing level** Display of all settings. No editing possible!

Note: The display may vary depending on the device version.

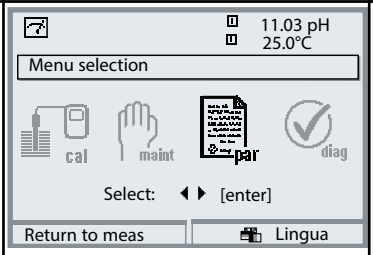
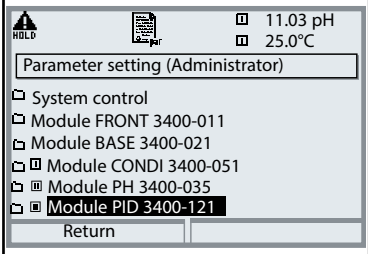
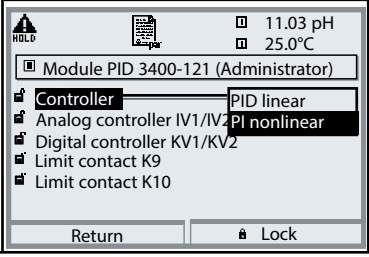
Parameter Setting: Locking a Function

Administrator level: Enabling/locking functions for Operator level
Note: Function check (HOLD) mode active (Setting: BASE module)

Menu	Display	Administrator level: Enable / lock functions
par		**Example:** Blocking access to the calibration adjustments from the Operator level **Open parameter setting** Select Administrator level. Enter passcode (default: 1989). Select "Module PH" (e.g.) using arrow keys, press **enter** to confirm.
		Select "Cal preset values" using arrow keys. "Block" with softkey.
		Now, the "Cal preset values" line is marked with the "lock" icon. This function cannot be accessed from the Operator level any more. The softkey function changes to "Release".
par		**Open parameter setting** Select Operator level, passcode (1246). Select "Module PH". Now, the locked function is displayed in gray and marked with the "lock" icon.

Note: The display may vary depending on the device version.

Configuring the Module

Menu	Display	Parameter setting
par		**Open parameter setting** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, press **enter** to confirm.
		Select "Module PID". Press **enter** to confirm.
		Select parameter using arrow keys, press **enter** to confirm.

Note: The display may vary depending on the device version.

During parameter setting the analyzer is in function check (HOLD) mode:
Current outputs and relay contacts behave as configured (BASE module).

Parameter Setting

Default Settings and Selection Range
Note: Function check (HOLD) mode active

Parameter	Default	Selection / Range
Controller: PID, linear		
Analog controller IV1/IV2		
• Controller type	Off	Off, 3-way mixing valve, straightway valve
• Controlled variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, %Air, %O_2, mg/l, pH, ORP
• Setpoint	7.0	Default setting: pH control
• Neutral zone	0.0	Default setting: pH control
• (P) Controller gain	100%	
• (I) Reset time	0000 sec	0000 = Off
• (D) Rate time	0000 sec	0000 = Off
• Feed time alarm after	0000 sec	0000 = Off
• Behavior during HOLD	Y=const	Y=0%, Y=const
• Output IV1/IV2	4 ... 20 mA	0 ... 20 mA, 4 ... 20 mA
Controller: PI, nonlinear		
Analog controller IV1/IV2		
• Controller type	Off	Off, 3-way mixing valve, straightway valve
• Controlled variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, %Air, %O_2, mg/l, pH, ORP
• Setpoint	7.0	
• Neutral zone	0.0	
• < Control beginning	2	
• < Vertex X	4	
• < Vertex Y	020.0 %	
• > Control end	12	
• > Vertex X	11	
• > Vertex Y	045.0 %	
• (I) Reset time	0000 s	
• Feed time alarm after	0000 s	
• Behavior during HOLD	Y=const	Y=0%, Y=const
• Output IV1/IV2	4 ... 20 mA	0 ... 20 mA, 4 ... 20 mA

Note: The menus may vary depending on the device version.

Parameter Setting

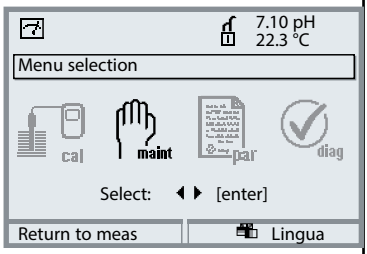
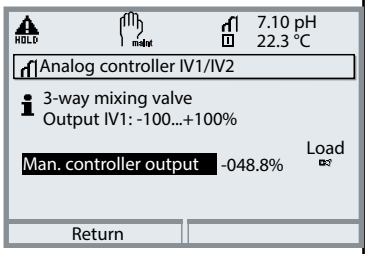
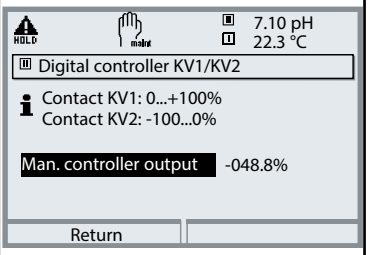
Default Settings and Selection Range
Note: Function check (HOLD) mode active

Parameter	Default	Selection / Range
Digital controller KV1/KV2		
• Controller type	Off	Off, 3-way mixing valve, straightway valve
• Controlled variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, %Air, %O_2, mg/l, pH, ORP, ...
• Setpoint	7.0	Default setting: pH control
• Neutral zone	0.0	Default setting: pH control
• (P) Controller gain	100%	
• (I) Reset time	0000 sec	0000 = Off
• (D) Rate time	0000 sec	0000 = Off
• Feed time alarm after	0000 sec	0000 = Off
• Behavior during HOLD	Y=const	Y=0%, Y=const
• Pulse period	0010 sec	Entry
• Max. pulse frequency	120 pulses/min	1 ... 180 pulses/min
Limit contacts K9/K10		The limit contacts can be configured separately
• Variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, g/kg, Ωcm, pH, ORP, rH, ..
• Limit value	0.0	Entry
• Hysteresis	0.1	Entry
• Effective direction	Min	Min, Max
• Contact type	N/O	Normally open N/O, normally closed N/C
• ON delay	0000 sec	Entry
• OFF delay	0000 sec	Entry

Note: The menus may vary depending on the device version.

Maintenance

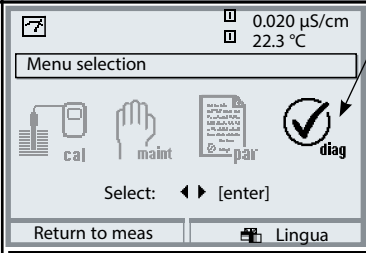
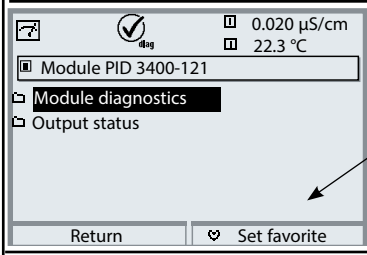
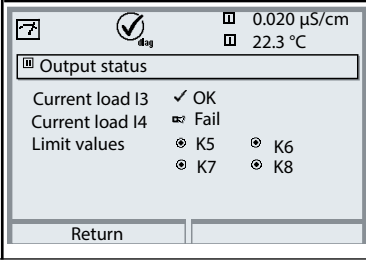
Analog Controller, Digital Controller
Note: Function check (HOLD) mode active

Menu	Display	Maintenance
maint		**Call up Maintenance** From the measuring mode: Press **menu** key to select menu. Select maintenance using arrow keys, press **enter** to confirm. Then select Module PID.
		**Analog controller IV1/IV2** The analog controller is configured during parameter setting. The default setting is shown on the display. For testing purposes, the controller output can be entered manually.
		**Digital controller KV1/KV2** The relay contacts (KV1/KV2) are configured during parameter setting. For testing purposes, the controller output can be entered manually.

Note: The display may vary depending on the device version.

Diagnostic Functions

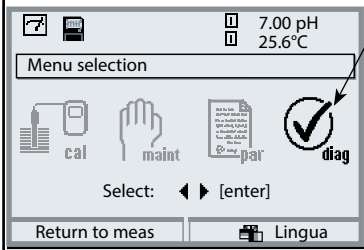
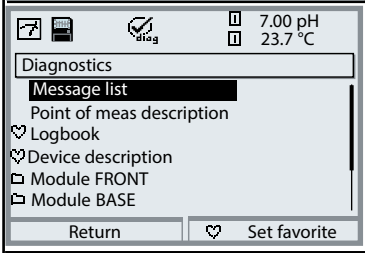
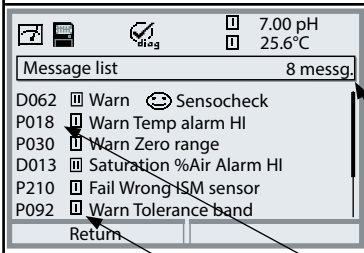
Select menu: Diagnostics

Menu	Display	Function
diag		**Opening the diagnostics menu** From the measuring mode: Press **menu** key to select menu. Select diagnostics using arrow keys, confirm by pressing **enter**. Then select "Module PID".
		The Diagnostics menu gives an overview of all diagnostics functions available. Functions which have been set as "Favorite" can be directly accessed from the measuring mode (see manual for basic unit).
		Diagnostic functions available: • Module diagnostics • Function test of internal components. • Output status (Fig.) • Status of signal outputs

Note: The display may vary depending on the device version.

Diagnostic Functions

General status information of the measuring system
Select menu: Diagnostics - Message list

Menu	Display	Diagnostic functions
diag		**Opening the diagnostics menu** From the measuring mode: Press **menu** key to select menu. Select diagnostics using arrow keys, confirm by pressing **enter**.
		The "Diagnostics" menu gives an overview of all functions available. Functions which have been set as "Favorite" can be directly accessed from the measuring mode.
		**Message list** Shows the currently activated warning or failure messages in plain text. **Number of messages** When there are more than 7 messages, a vertical scrollbar appears. Scroll with the up/down arrow keys. **Message identifier** See message list for description. **Module identifier** Specifies the module that has generated the message.

Note: The display may vary depending on the device version.

Messages

Messages for PID 3400(X)-121 Module with Protos 3400(X)

No.	PID messages	Message type
R008	Meas. processing (factory settings)	FAIL
R009	Module failure (Firmware Flash check sum)	FAIL
R014	Feed time A controller Alarm HI_HI	FAIL
R019	Feed time D controller Alarm HI_HI	FAIL
R073	Current IV1 Load error	FAIL
R078	Current IV2 Load error	FAIL
R200	Control parameters	WARN
R254	Module reset	Text

Messages for PID 3400(X)-121 Module with Protos II 4400(X)

⊗ Failure ⚠ Out of Specification ◈ Maintenance Required

No.	Message Type	PID Messages
R008	Failure	Meas. Processing (Factory Settings)
R009	Failure	Firmware Error
R014	Failure	Analog Controller Dosing Time Alarm HI_HI
R019	Failure	Digital Controller Dosing Time Alarm HI_HI
R073	Failure	Current IV1, Load Error
R078	Failure	Current IV2, Load Error
R200	Maintenance Required	Control Parameters
R254	Info	Module Reset

Specifications

Specifications Protos PID 3400(X)-121

Analog controller outputs IV1, IV2	0/4... 20 mA, passive
Supply voltage	3 ... 30 V, I_{max} = 100 mA
Load monitoring	Error message if load is exceeded
Measurement error**	< 0,25 % current value + 0.05 mA
Usage	Actuation of analog control valves • IV1: active below setpoint (for straightway valves) • IV2: active above setpoint (for straightway valves)
Digital controller outputs KV1, KV2	Electronic relay outputs, polarized, floating, connected to each other and to K9, K10
Voltage drop	< 1.2 V
Loadability	DC: V_{max} = 30 V, I_{max} = 100 mA
Usage	Actuation of straightway valves, metering pumps • KV1: active below setpoint • KV2: active above setpoint
PID process controller	Continuous controller via the current outputs IV1, IV2 or / and quasi-continuous controller via the KV1, KV2 relay contacts
Controlled variable*	User-defined, depending on measuring modules installed (primary variables only: pH, ORP, °C, S/cm, % O_2, % Air)
Setpoint specification*)	As desired within range
Neutral zone*	As desired within range
P action*	Controller gain Kp: 0010 ... 9999 %
I action*	Reset time Tr: 0000 ... 9999 sec (0000 s = no integral action)
D action*	Rate time Td: 0000 ... 9999 sec (0000 s = no derivative action)
Pulse length controller*	0001 ... 0600 sec, min. ON time 0.5 sec
Pulse frequency controller*	0001 ... 0180 min^{-1}
Behavior during HOLD*	Controller output Y = const. or controller output Y = 0

Man. controller output	Manual specification for testing or starting up a process, bumpless switchover to automatic when I-action component ≠ 0000 s
Pulse period	0001 s (pulse length controller)

Switching output K9/K10	Electronic relay outputs, polarized, floating, connected to each other and to KV1, KV2
Voltage drop	< 1.2 V
Loadability	DC: V_{max} = 30 V, I_{max} = 100 mA
Usage	Limit monitoring or pre-control (3-point controller), process variable, threshold, hysteresis, contact type (N/C, N/O), switch-on / switch-off delay definable as desired

* User-defined

** at rated operating conditions

Specifications

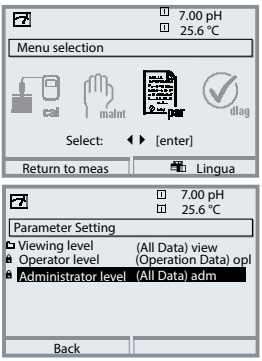
General data

Explosion protection (Ex version of module only)	See certificates or www.knick.de
RoHS conformity	According to EU directive 2011/65/EU
EMC	EN 61326-1, EN 61326-2-3 NAMUR NE 21
Emitted interference	Industrial applications* (EN 55011 Group 1 Class A)
Interference immunity	Industrial applications
Lightning protection	to EN 61000-4-5, Installation class 2
Rated operating conditions	Ambient temperature: Safe area: -20 ... 55 °C / -4 ... 131 °F Ex: -20 ... 50 °C / -4 ... 122 °F Relative humidity: 10 ... 95 % non-condensing
Transport/storage temperature	-20 ... 70 °C / -4 ... 158 °F
Screw clamp connector	Single or stranded wires up to 2.5 mm^2

* This equipment is not designed for domestic use, and is unable to guarantee adequate protection of the radio reception in such environments.

Parameter Setting Menu

Note: The menus may vary depending on the device version



Parameter Setting

From measuring mode: Press **menu** key to select menu.
Select parameter setting using arrow keys,
press **enter** to confirm.

Administrator level
Access to all functions, also passcode setting. Releasing or blocking functions for access from the Operator level.

Operator level
Access to all functions which have been released at the Administrator level. Blocked functions are displayed in gray and cannot be edited.

Viewing level
Only display, no editing possible!

System Control

Memory card (Option)	Menu only appears when a memory card is inserted and the corresponding add-on function has been enabled.
Transfer configuration	The complete configuration of a device can be written on a memory card. This allows transferring all device settings to other devices with identical equipment (exception: options and passcodes).
Parameter set	2 parameter sets (A, B) are available in the device. The currently active parameter set is shown in the display. Parameter sets contain all settings except: sensor type, options, system control settings Up to 5 parameter sets (1, 2, 3, 4, 5) are available when a memory card (Option) is used.
Function control	Select the functions to be controlled via softkeys and OK inputs
Time/date	Time, date, display format
Meas. point description	Free input of a tag number, can be called from the diagnostics menu
Release of options	Option activation via TAN
Reset to default	Reset all parameters to factory setting
Passcode entry	Change passcodes
Firmware update	Update the firmware using an Update Card
Logbook	Select the events to be recorded

Note: The menus may vary depending on the device version

Parameter Setting Menu

FRONT Module: Display Settings	
Language	Select the menu language
Units[1)]	Select the measurement units
Formats[1)]	Select the display format
Measurement display	Representation of measured values on the display
Display	Brightness/contrast, auto-off
BASE Module: Signal Outputs and Inputs, Contacts	
Output current I1, I2	Separately adjustable current outputs
Contact K4	Failure signaling
Contacts K3, K2, K1	Separately adjustable relay contacts
Inputs OK1, OK2	Optocoupler signal inputs

1) Only with Protos II 4400(X)

Parameter Setting of PID 3400(X)-121 Module

Parameter	Default	Selection / Range
Controller: PID, linear		
Analog controller IV1/IV2		
• Controller type	Off	Off, 3-way mixing valve, straightway valve
• Controlled variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, %Air, %O_2, mg/l, pH, ORP
• Setpoint	7.0	Default setting: pH control
• Neutral zone	0.0	Default setting: pH control
• (P) Controller gain	100%	
• (I) Reset time	0000 sec	0000 = Off
• (D) Rate time	0000 sec	0000 = Off
• Feed time alarm after	0000 sec	0000 = Off
• Behavior during HOLD	Y=const	Y=0%, Y=const
• Output IV1/IV2	4 ... 20 mA	0 ... 20 mA, 4 ... 20 mA
Controller: PI, nonlinear		
Analog controller IV1/IV2		
• Controller type	Off	Off, 3-way mixing valve, straightway valve
• Controlled variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, %Air, %O_2, mg/l, pH, ORP
• Setpoint	7.0	
• Neutral zone	0.0	
• < Control beginning	2	
• < Vertex X	4	
• < Vertex Y	020.0 %	
• > Control end	12	
• > Vertex X	11	
• > Vertex Y	045.0 %	
• (I) Reset time	0000 s	
• Feed time alarm after	0000 s	
• Behavior during HOLD	Y=const	Y=0%, Y=const
• Output IV1/IV2	4 ... 20 mA	0 ... 20 mA, 4 ... 20 mA

Note: The menus may vary depending on the device version.

Parameter Setting of PID 3400(X)-121 Module

Parameter	Default	Selection / Range
Digital controller KV1/KV2		
• Controller type	Off	Off, 3-way mixing valve, straightway valve
• Controlled variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, %Air, %O_2, mg/l, pH, ORP, ...
• Setpoint	7.0	Default setting: pH control
• Neutral zone	0.0	Default setting: pH control
• (P) Controller gain	100%	
• (I) Reset time	0000 sec	0000 = Off
• (D) Rate time	0000 sec	0000 = Off
• Feed time alarm after	0000 sec	0000 = Off
• Behavior during HOLD	Y=const	Y=0%, Y=const
• Pulse period	0010 sec	Entry
• Max. pulse frequency	120 pulses/min	1 ... 180 pulses/min
Limit contacts K9/K10		The limit contacts can be configured separately
• Variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, g/kg, Ωcm, pH, ORP, rH, ..
• Limit value	0.0	Entry
• Hysteresis	0.1	Entry
• Effective direction	Min	Min, Max
• Contact type	N/O	Normally open N/O, normally closed N/C
• ON delay	0000 sec	Entry
• OFF delay	0000 sec	Entry

Note: The menus may vary depending on the device version.

Maintenance Menu

BASE Module

Current source	Output current definable 0 ... 22 mA

PID 3400(X)-121 Module

Current source	Output current definable 0 ... 22 mA
Analog controller IV1/IV2	Controller output can be entered manually (function test)
Digital controller KV1/KV2	Controller output can be entered manually (function test)

Diagnostics Menu

Message list	List of all warning and failure messages
Point of meas description	
Logbook	
Device description	Hardware version, Serial no., (Module) Firmware, Options

FRONT Module

Module diagnostics
Display test
Keypad test

BASE Module

Module diagnostics
Input/output status

PID 3400(X)-121 Module

Module diagnostics
Input/output status

Note: The menus may vary depending on the device version.

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