

Operating Instruction

PROLINE Interface Modules

from serial: B 01
from Software version 1.0
YAAE0019

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Contents

1	SAFETY INFORMATION.....	4
1.1	GENERAL SAFETY INFORMATION	4
1.2	OTHER SAFETY INFORMATION	4
2	INSTALLING MODULES.....	5
3	MENU STRUCTURE FOR ALL MODULES (ONLY COMMAND).....	6
4	SERIAL INTERFACES RS232 / 485	7
4.1	MENU STRUCTURE FOR RS232 / 485 INTERFACE MODULE (MASTER)	7
4.2	RS 232 INTERFACE	8
4.2.1	Connecting cables and interface test RS 232	8
4.2.2	Protocol RS 232.....	8
4.3	RS 485 INTERFACE	9
4.3.1	Connecting cable RS 485	9
4.3.2	Protocol RS 485.....	9
4.4	WRITE COMMANDS (DATA COMMANDS TO THE THERMOSTAT)	10
4.5	READ COMMANDS (DATA REQUESTED FROM THE THERMOSTAT)	11
4.6	ERROR MESSAGES	13
4.7	DRIVER SOFTWARE FOR LABVIEW®	13
5	ANALOGUE MODULE.....	14
5.1	MENU STRUCTURE ANALOGUE MODULE (MASTER)	15
6	CONTACT MODULE.....	16
6.1	CONTACT MODULE LRZ 915 WITH THREE INPUTS AND THREE OUTPUTS	16
6.2	NAMUR-CONTACT MODULE LRZ 914 WITH ONLY ONE INPUT AND ONE OUTPUT	17
6.3	MENU STRUCTURE CONTACT MODULE (MASTER)	18
7	INDEX.....	19

Explanation of signs:



Danger: This sign is used where there may be injury to personnel if a recommendation is not followed accurately disregarded.



Note: Here special attention is drawn to some aspect. May include reference to danger.



Reference: Refers to other information in different Sections.

1 Safety information

1.1 General safety information

A laboratory thermostat heats and circulates liquids according to specified parameters. This involves hazards due to high temperatures, fire and general hazards due to the application of electrical energy.

The user is extensively protected by the application of relevant standards.

Other sources of hazards may arise due to the type of tempering medium, e.g. by exceeding or undercutting certain temperature thresholds or with the breakage of the container and reaction with the tempering liquid.

It is not possible to consider all eventualities. They remain largely subject to the judgment and responsibility of the operator.

The equipment may only be used as prescribed and as described in these operating instructions. This includes operation by instructed specialist personnel.

The equipment fulfils the following classes of the EMC standard EN 61326-1:

Class A: Operation only on networks without connected domestic areas.

Class B: Equipment for operation on networks with connected domestic areas.

Class B*: Equipment fulfils Class B when a house connection > 100 A is involved. With unfavourable network conditions disturbing voltage variations may otherwise occur.

The equipment is not rated for use under medical conditions according to EN 60601-1 or IEC 601-1.

1.2 Other safety information

Follow the operating instructions for the thermostat.

Only connect equipment to PE grounded mains sockets.

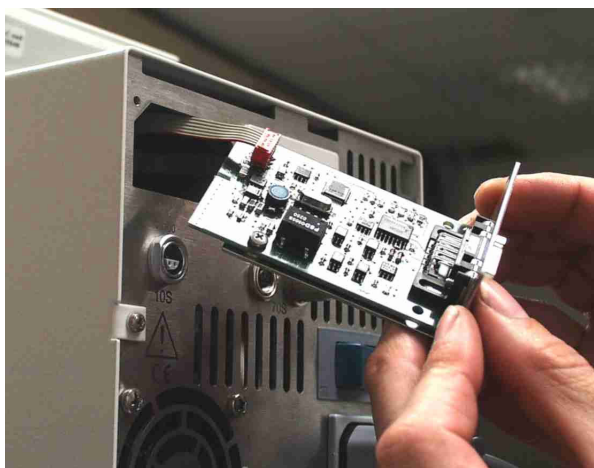
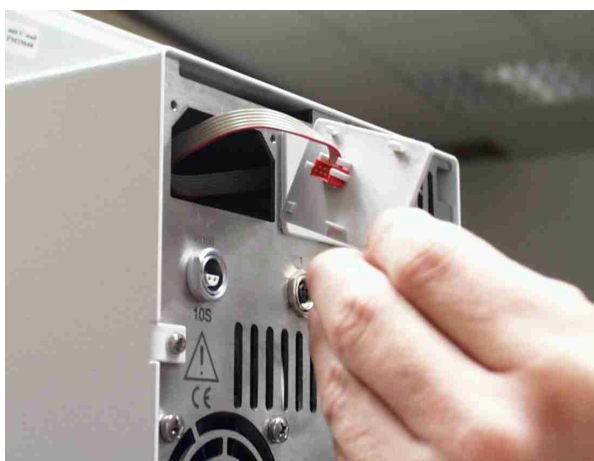
Withdraw the mains plug before cleaning, maintenance or moving the thermostat.

Repairs in the control section must only be carried out by specialist personnel!

Figures of temperature constancy and display accuracy apply under normal conditions according to DIN 12876. Electromagnetic high frequency fields may in special cases lead to unfavorable values. Safety is not impaired.

2 Installing modules

The master and command can be supplemented with further interface modules which are simply inserted at the back of the control head into two module slots (⇒ operating manual for the Proline thermostat).



- Touch the earthed bath cover of the Proline thermostat to discharge any electrostatic charge.
- Remove the module from its packaging
- Switch off the thermostat and pull out the mains plug.
- Insert a screwdriver into the lower recess of the module cavity and prise up the plastic cover. The cover can then be pulled off downwards.

- Pull out the plug of the bus connecting cable from the plastic cover.

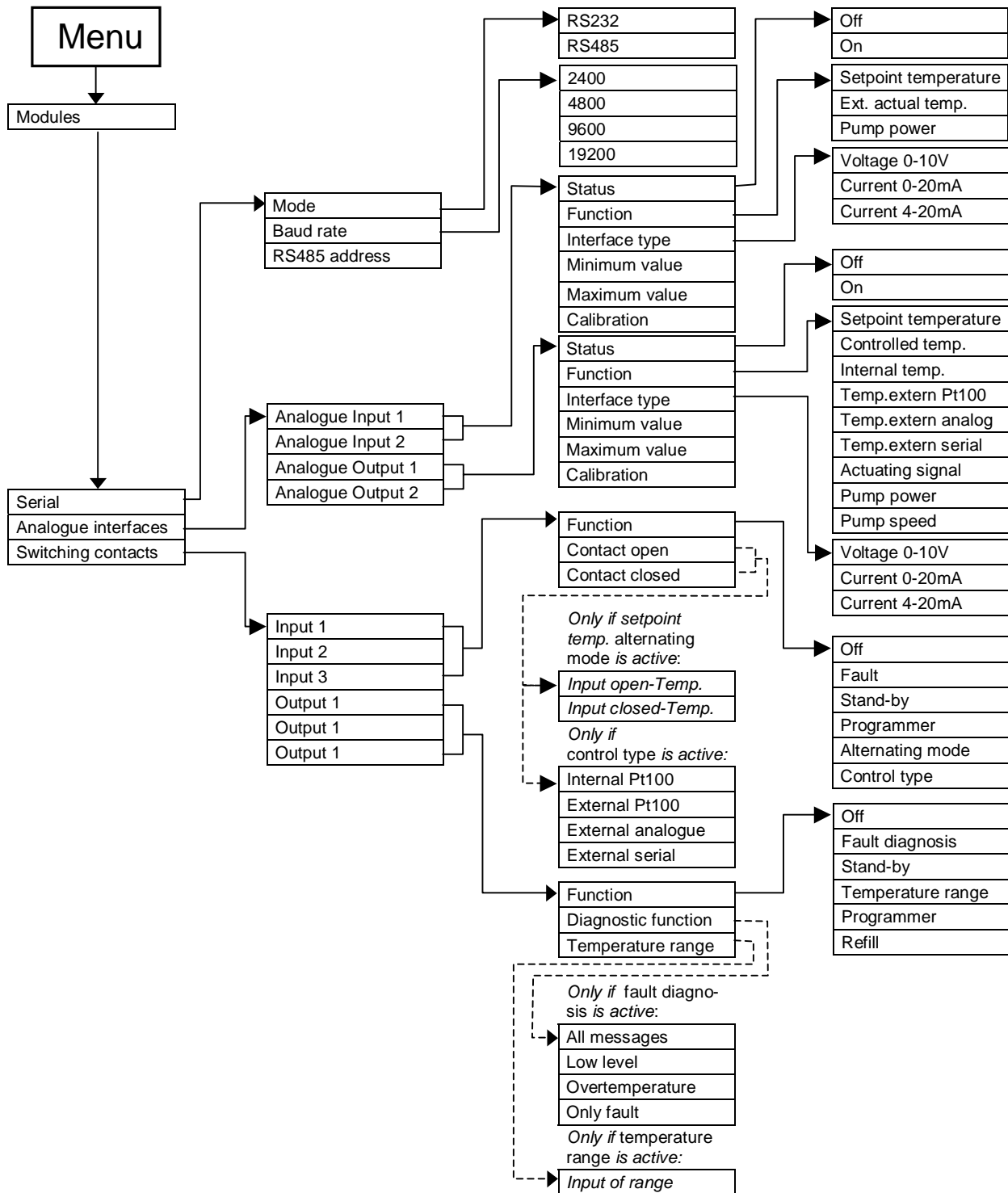
- Plug on the bus connecting cable (red plug onto red socket).
- Insert the module and secure with the two cross-head screws.
- Connect the mains plug again and switch on the thermostat.



The plugs are protected against reverse polarity. The plugs have a ridge which slides into a groove in the socket.

3 Menu structure for all modules (only Command)

All existing menu points are illustrated. However, the Command Console masks out menu points which cannot be executed. Further information can be found in the following sections.

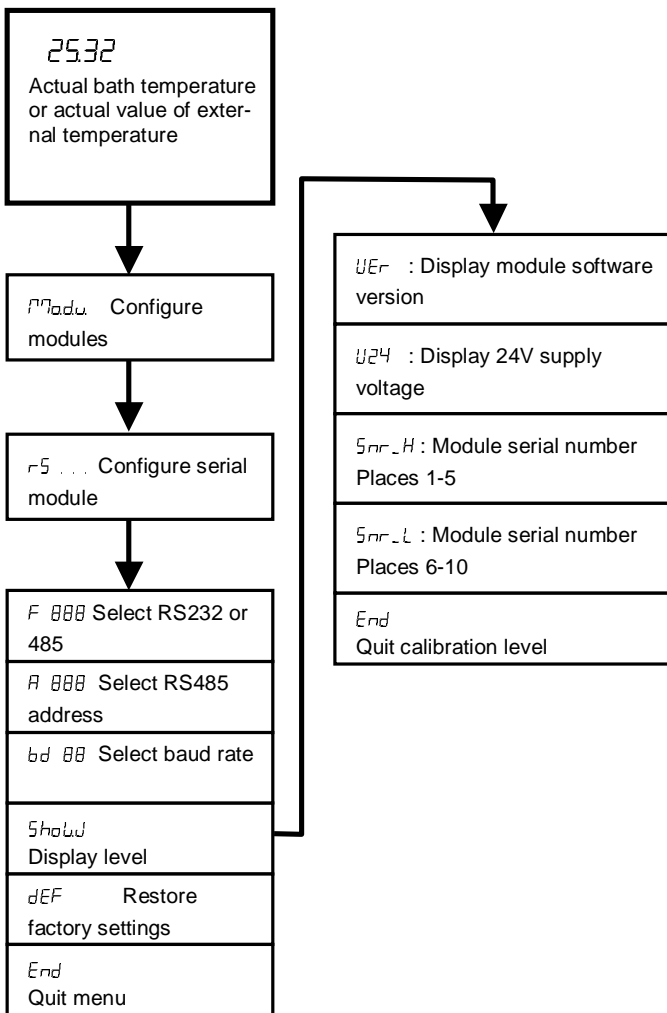


4 Serial interfaces RS232 / 485

RS232 / 485 Interface Module (order no. LRZ 913) with 9-pole SUB-D socket. Electrically isolated by optocoupler. With the LAUDA instruction set essentially compatible to the Ecoline and Integra Series. The RS232 interface can be connected directly to the PC with a 1:1 through-contact cable (order no. EKS 037).

4.1 Menu structure for RS232 / 485 Interface Module (Master)

All existing menu points are illustrated. However, the Master unit masks out menu points which cannot be executed.



4.2 RS 232 Interface

4.2.1 Connecting cables and interface test RS 232

Signal	Computer				Thermostat		Signal
	9-pin sub-D-socket		25-pin sub-D-socket		9-pin sub-D-socket		
	①	②	①	②	①	②	
R x D	2	2	3	3	2	2	T x D
T x D	3	3	2	2	3	3	R x D
DTR	4		20		4		DSR
Signal Ground	5	5	7	7	5	5	Signal Ground
DSR	6		6		6		DTR
RTS	7		4		7		CTS
CTS	8		5		8		RTS

① with hardware handshake: For connecting a thermostat to the PC use 1:1 cable and not a null-modem cable!

② without hardware handshake: the computer / PC must be set to the operating mode "without hardware handshake".



- Use screened connecting cable..
- Connect screen to connector case.
- The connections are isolated from the remainder of the electronics.
- Any pins not in use must not be connected!!

When a PC is connected up the RS232 interface can easily be tested using the Microsoft Windows operating system. On Windows® 95/ 98/ NT/ XP with the „Hyper Terminal” program.

4.2.2 Protocol RS 232



- The interface operates with 1 stop bit, no parity bit and 8 data bits..
- Transfer rate either 2400, 4800, 9600 (factory setting) or 19200 baud as selected..
- The RS232 interface can be operated with or without hardware handshake, (RTS/CTS).
- The command from the computer must be terminated with CR, CRLF, or LFCR.
- The response of the thermostat is always terminated with CRLF.

CR = Carriage Return (Hex: 0D)

LF = Line Feed (Hex: 0A)

Example: Transfer of setpoint 30,5°C to the thermostat

Rechner	Thermostat
„OUT_SP_00_30.5“CRLF	⇒
⇐	„OK“CRLF

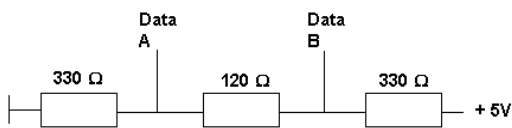
4.3 RS 485 Interface

4.3.1 Connecting cable RS 485

Thermostat	
9-pin sub-D-socket	
Pin	Data
1	Data A
5	SG (Signal Ground) optional
6	Data B



- Use screened connecting cables.
- Connect screen to connector case.
- The connections are isolated from the remainder of the electronics.
- Any pins not in use must not be connected!!



An **RS 485** bus always requires bus termination in the form of a termination network which ensures a **defined rest status in the high-resistance phases of bus operation**. The bus termination is as follows:

This termination network is usually incorporated on the PC plug-in card (RS 485).

4.3.2 Protocol RS 485



- The interface operates with 1 stop bit, no parity bit and 8 data bits.
- Transfer rate either 2400, 4800, 9600 (Factory setting) or 19200 baud as selected.
- The RS 485 commands are always preceded by the device address. There is provision for 127 addresses. The address must always have 3 digits. (A000_...to A127_...)
- The command from the computer must be terminated with CR.
- The response of the thermostat is always terminated with CR.

CR = Carriage Return (Hex: 0D)

Example: Transfer of setpoint 30.5°C to the thermostat with address 15.

Computer	Thermostat
„A015_OUT_SP_00_30.5“CR	⇒
⇐	„A015_OK“CR

4.4 Write commands (Data commands to the thermostat)

Command	Explanation
OUT_PV_05_XXX.XX	Externe Temperatur über Schnittstelle vorgeben
OUT_SP_00_XXX.XX	Sollwertübergabe mit max. 3 Stellen vor dem Dezimalpunkt und max. 2 Stellen danach
OUT_SP_01_XXX	Pumpenleistungsstufe 1 bis 8
OUT_SP_04_XXX	TiH outflow temperature high limit
OUT_SP_05_XXX	TiL outflow temperature low limit
OUT_PAR_00_XXX.X	Setting of control parameter Xp
OUT_PAR_01_XXX	Setting of control parameter Tn (5...180s; 181 = Off)
OUT_PAR_02_XXX	Setting of control parameter Tv
OUT_PAR_03_XXX.X	Setting of control parameter Td
OUT_PAR_04_XXX.XX	Setting of control parameter KpE
OUT_PAR_05_XXX	Setting of control parameter TnE (0...998s; 999 = Off)
OUT_PAR_06_XXX	Setting of control parameter TvE
OUT_PAR_07_XXX.X	Setting of control parameter TdE
OUT_PAR_09_XXX.X	Setting of the max. outflow temperature limit
OUT_PAR_10_XXX.X	Setting of control parameter XpF
OUT_PAR_11_XXX	Setting of control parameter TnF (5...180s; 181 = Off)
OUT_PAR_12_XXX	Setting of control parameter TvF
OUT_PAR_13_XXX.X	Setting of control parameter TdF
OUT_PAR_14_XXX.X	Setting of the setpoint offset
OUT_MODE_00_X	Keys Master: 0 = free / 1 = inhibited (corresponds to "KEY")
OUT_MODE_01_X	Control: 0 = internal / 1 = external Pt100 / 2 = external Analogue / 3 = external Serial
OUT_MODE_03_X	Keys Command: 0 = free / 1 = inhibited
OUT_MODE_04_X	Setpoint offset source: 0=normal/1=ext.Pt/2=ext.analog/3=ext.serial
RMP_SELECT_X	Selection of the programme (1...5) to which the further instructions apply. When the unit is switched on, programme 5 is selected automatically.
RMP_START	Start the programmer
RMP_PAUSE	Hold (pause) the programmer
RMP_CONT	Restart the programmer after pause
RMP_STOP	Terminate the programmer
RMP_RESET	Delete the programmer (all Segments)
RMP_OUT_00_XXX.XX_XXX	Set a programme segment (temperature and time). A segment is added and appropriate values are applied to it.
RMP_OUT_02_XXX	Number of times the programme runs: 0 = unlimited / 1...250
RMP_OUT_06_XXX.XX	Programmer tolerance setting (0 = off / 0.01°C...450.00°C). All following segments receive this tolerance setting.

Command	Explanation
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- For " " use also " " (blank character).
- Response from thermostat "OK" or in case of error "ERR_X" (RS 485 interface e.g. "A015_OK" or in case of error "A015_ERR_X".)

Permitted data formats:

-XXX.XX	-XXX.X	-XXX.	-XXX	XXX.XX	XXX.X	XXX.	XXX
-XX.XX	-XX.X	-XX.	-XX	XX.XX	XX.X	XX.	XX
-X.XX	-X.X	-X.	-X	X.XX	X.X	X.	X
-.XX	-.X	.XX	.X				

4.5 Read commands (Data requested from the thermostat)

Command	Explanation
IN_PV_00	Read bath temperature (outflow temperature)
IN_PV_01	Abfrage der geregelten Temp. (int./ext. Pt/ext. Analogue/ext. Serial)
IN_PV_03	Read external temperature TE (Pt100)
IN_PV_04	Read external temperature TE (Analogue input)
IN_PV_10	Read bath temperature (outflow temperature) in 0.001 °C
IN_PV_13	Read external temperature TE (Pt100) in 0.001 °C
IN_SP_00	Read temperature setpoint
IN_SP_01	Interrogation of pump power stage
IN_SP_03	Read current overtemperature switch-off point
IN_SP_04	Read current outflow temperature limit TiH.
IN_SP_05	Read current outflow temperature limit TiL.
IN_PAR_00	Read current value of Xp
IN_PAR_01	Read current value of Tn (181 = OFF)
IN_PAR_02	Read current value of Tv
IN_PAR_03	Read current value of Td
IN_PAR_04	Read current value of KpE
IN_PAR_05	Read current value of TnE (999 = OFF)
IN_PAR_06	Read current value of TvE
IN_PAR_07	Read current value of TdE
IN_PAR_09	Interrogation of the max. outflow temperature limit
IN_PAR_10	Read current value of XpF
IN_PAR_11	Read current value of TnF (181 = OFF)
IN_PAR_12	Read current value of TvF
IN_PAR_13	Read current value of TdF
IN_PAR_14	Interrogation of the setpoint offset
IN_DI_01	Status of contact input 1: 0 = open/ 1 = closed
IN_DI_02	Status of contact input 2: 0 = open/ 1 = closed
IN_DI_03	Status of contact input 3: 0 = open/ 1 = closed
IN_DO_01	State of Contact output 1: 0 = make-contact open/ 1 = make-contact closed
IN_DO_02	State of Contact output 2: 0 = make-contact open/ 1 = make-contact closed

Command	Explanation
IN_DO_03	State of Contact output 3: 0 = make-contact open/ 1 = make-contact closed
IN_MODE_00	Keys Master: 0 = free / 1 = inhibited
IN_MODE_01	Control: 0 = int. / 1 = ext. Pt100 / 2 = ext. Analogue / 3 = ext. Serial
IN_MODE_02	Standby: 0 = Unit ON / 1 = Unit OFF
IN_MODE_03	Keys Command: 0 = free / 1 = inhibited
IN_MODE_04	Setpoint offset source: 0=normal/1=ext.Pt/2=ext.analogue/3=ext.serial
TYPE	Read equipment type
VERSION_R	Read software type of control system
VERSION_S	Read software type of protection system
VERSION_B	Read software type of Command
VERSION_T	Read software type of cooling system
VERSION_A	Read software type of analogue module
VERSION_V	Read software type of RS232/485 module
VERSION_D	Read software type of digital module
STATUS	Read equipment status 0 = OK, -1 = error
STAT	Read error diagnosis response: XXXXXXXX → X = 0 no error, X = 1, 2, 3 error Char = error (Exx) Char = pump error Char = low level error Char = over temperature error Char = refrigeration unit error Char = no external temperature probe (TE FAIL) Char = error analogue inputs 0 = OK / 1 = Analogue input 1 < 4mA / 2 = Analogue input 2 < 4mA / 3 = both Analogue input < 4mA
RMP_IN_00_XXX	Read a programme segment XXX (response: e. g. 030.00_010.00 = 30.00°C and 10 min)
RMP_IN_01	Read the current segment number
RMP_IN_02	Read the set number of programme runs
RMP_IN_03	Read the current programme run
RMP_IN_04	Read the programme to which further instructions apply
RMP_IN_05	Read which programme is running now (0=none)



- For " " use also " " (blank character).
- The equipment response is always in the fixed decimal format "XXX.XX" or for negative values "-XXX.XX" or "ERR_X". (RS 485 interface e.g.. "A015_XXX.XX" or "A015_-XXX.XX" or "A015_ERR_X")

4.6 Error messages

Message	Explanation
ERR_2	Wrong input (e.g. buffer overflow)
ERR_3	Wrong command
ERR_5	Syntax error in value
ERR_6	Illegal value
ERR_8	Module (ext. temperature) not available
ERR_30	Programmer, all segments occupied
ERR_31	Set point not possible, analogue set point input ON
ERR_32	TiH <= TiL
ERR_33	No external sensor
ERR_34	Analogue value not available
ERR_35	Auto is selected
ERR_36	No set point input possible. Programmer is running or is paused.
ERR_37	No start from programmer possible, analogue setpoint input is switched on.

4.7 Driver software for LABVIEW®

Available mid-2004.

5 Analogue module

The analogue module (order no. LRZ 912) has 2 inputs and 2 outputs which are brought out on a 6-pole DIN socket to Namur Recommendation (NE28). The inputs and outputs can be set independently as 4...20 mA, 0...20 mA or 0...10V interface. Various functions can be selected for the inputs and outputs. Accordingly, the signal on the input is interpreted differently and different information is output via the output connection.

In addition the interfaces can be scaled freely according to the set function.

The following values can be specified via the inputs:

- setpoint temperature with function: f_{T5} or [redacted]
- external actual temperature with function: f_{TE} or [redacted]
- Pump power with function: f_{PP} or **Pump power**

The following values can be specified via the outputs:

- Setpoint temperature with function: Master: f_{T5} or Command: **Set temperature**
- The temperature source with which active control occurs: f_{TC} **Controlled temp.**
- actual temperature (bath temperature): f_{TI} or **Internal Temp.**
- external actual temperature from Pt100: f_{TEP} or **Temp.external Pt100**
- external actual temperature from analogue input: f_{TEA} or **Temp.external analogue**
- external actual temperature from the serial interface: f_{TES} or **Temp.external serial**
- actuating signal: f_Y or **Stellgröße**
- Pump power: f_{PP} or **Pump power**
- Pump speed: f_{E_n} or **Pump speed**

In addition the interfaces can be scaled freely with L_{00} / H_{1000} in % or **minimal value / maximal value** according to the set function.

For example: 4 mA corresponds to 0°C and 20 mA corresponds to 100°C

- Accuracy of the inputs and outputs after calibration better than 0.1% F.S.
- Inputs, current Input resistance < 100 Ohm
- Inputs, voltage Input resistance > 50 kOhm
- Outputs, current Burden < 400 Ohm
- Outputs, voltage Load > 10 kOhm

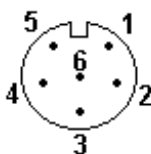


Connection of the analogue inputs and outputs

A 6-pole round connector with screw locking and contact arrangement according to DIN 45322 or IEC 130-9 is needed.

A suitable coupling plug can be obtained under order no. EQS 057.

View of the socket (front) or solder side of plug:



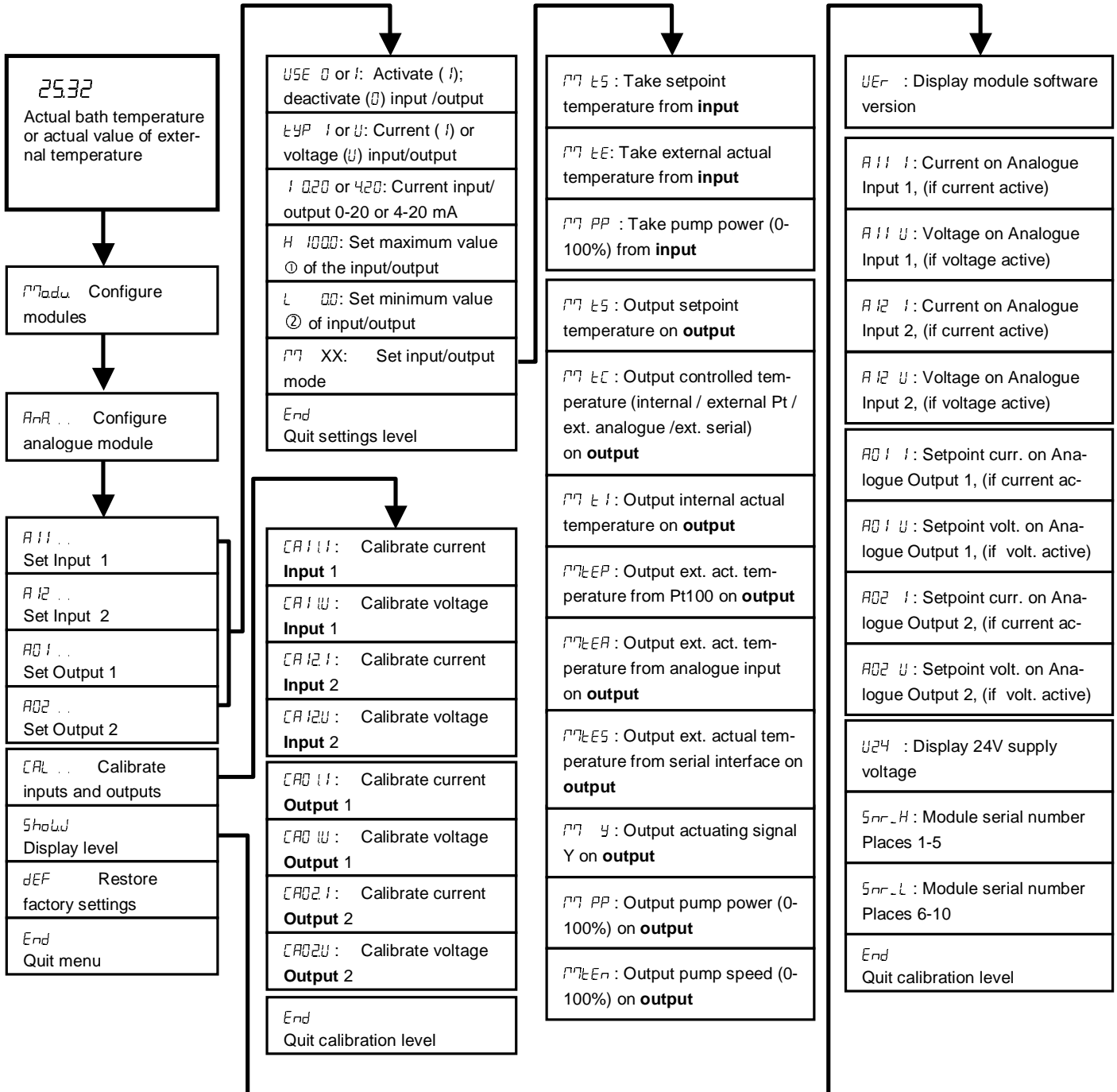
- Pin 1 Output 1
- Pin 2 Output 2
- Pin 3 0V reference potential
- Pin 4 Input 1
- Pin 5 0V reference potential
- Pin 6 Input 2



Use shielded lines. Connect shielding with connector housing!

5.1 Menu structure Analogue module (Master)

All existing menu points are illustrated. However, the Master unit masks out menu points which cannot be executed.



① corresponds to 20mA or 10V
 ② corresponds to 0mA, 4mA or 0V

6 Contact module

6.1 Contact module LRZ 915 with three inputs and three outputs

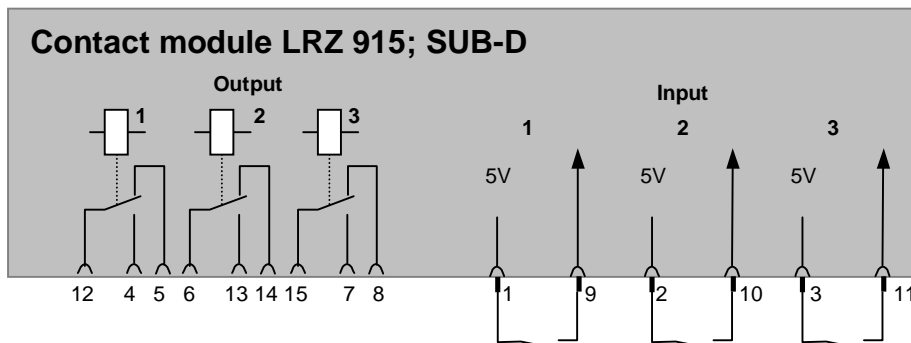
Contact module Cat. no. LRZ 915) on 15 pole SUB-D socket. With three relay contact outputs (changeover, max. 30V/ 0.2A) and three binary inputs for control via external voltage-free contacts.

The following functions are made available by the inputs:

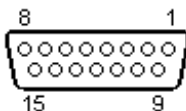
- set fault with function: Master: *F ALA* or Command: **Fault**
- set Stand-by with function: *F Stb* or **Stand-by**
- control programmer with function: *F PrB* or **Programmer**
- control alternating mode (two different setpoint temperatures): *F tZC* or [REDACTED]
- controller mode (internal ↔ external control): *F Con* or [REDACTED]

The following functions are made available by the outputs::

- signal various fault states: *F d, R* or [REDACTED]
- signalling standby: *F Stb* or **Stand-by**
- providing status of the window discriminators (inside ↔ outside): *F WJ* or [REDACTED]
- providing the programmer status: *F PrB* or **Programmer**
- signalling refill of bath medium: *F F IL* or [REDACTED]



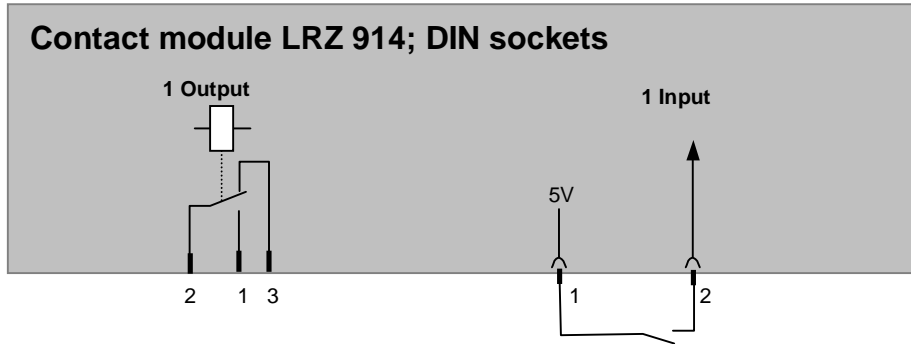
Contact inputs and outputs



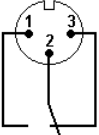
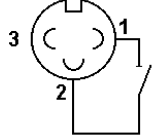
- View of the socket from the plug side or of the plug on the solder side.
- A suitable 15-pole Sub-D plug can be obtained together with a suitable housing:
Order no. EQM 030 and plug housing order no. EQG 017.

6.2 Namur-Contact module LRZ 914 with only one input and one output

Contact module (Cat. no. LRZ 914) with connector to NAMUR NE28. Functionality as LRZ 915, but only one output and one input on each of two DIN sockets



Contact inputs and outputs:

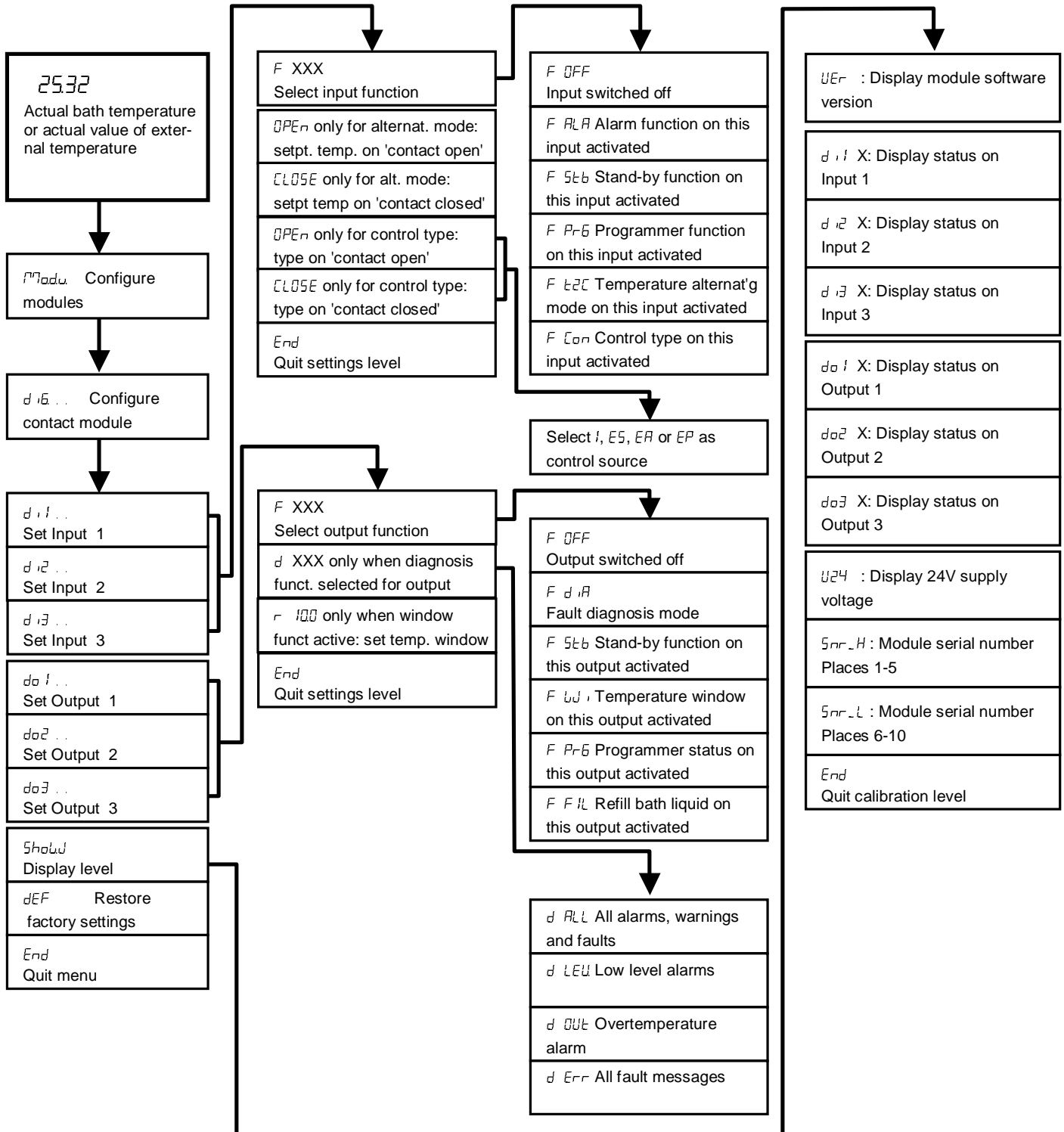
Output	Input
<ul style="list-style-type: none"> - View on flange plug (Front) or solder side coupler socket - Max. 30V; 0,2A - Coupler socket Cat. no. EQD 047 	<ul style="list-style-type: none"> - View on flange plug (Front) or solder side coupler socket - Signal ca. 5V, 10mA. Do not use pin 3! Coupling plug Cat. no. EQS 048
<p>1 = n.o. (make) 2 = common, 3 = n.c. (break)</p> 	



- Use shielded lines. Connect shielding with connector housing. Cover unused plug connections with protecting caps!

6.3 Menu structure contact module (Master)

All existing dialogue boxes are illustrated. The Master unit however masks out commands which cannot be executed



7 Index

Analogue module.....	13	Instructed specialist personnel	3	Interface modules.....	4
Installation.....	4	Contact module.....	15	Sources of Hazards	3
EMC standard EN 61326-1	3	RS232 / 485 Interface Modules	6	Symbol	2
Hazards.....	3	Safety information	3		

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Betreiber / Responsible person / Personne responsable: _____

Hiermit bestätigen wir, daß nachfolgend aufgeführtes LAUDA-Gerät (Daten vom Typenschild):

We herewith confirm that the following LAUDA-equipment (see label):

Par la présente nous confirmons que l'appareil LAUDA (voir plaque signalétique):

Typ / Type / Type :	Serien-Nr. / Serial no. / No. de série:

mit folgendem Medium betrieben wurde

was used with the below mentioned media

a été utilisé avec le liquide suivant

Darüber hinaus bestätigen wir, daß das oben aufgeführte Gerät sorgfältig gereinigt wurde, die Anschlüsse verschlossen sind, und sich weder giftige, aggressive, radioaktive noch andere gefährliche Medien in dem Gerät befinden.

Additionally we confirm that the above mentioned equipment has been cleaned, that all connectors are closed and that there are no poisonous, aggressive, radioactive or other dangerous media inside the equipment.

D'autre part, nous confirmons que l'appareil mentionné ci-dessus a été nettoyé correctement, que les tubulures sont fermées et qu'il n'y a aucun produit toxique, agressif, radioactif ou autre produit nocif ou dangereux dans la cuve.

Stempel Seal / Cachet.	Datum Date / Date	Betreiber Responsible person / Personne responsable

Formblatt / Form / Formulaire:

Unbedenk.doc

Erstellt / published / établi:

LSC

Änd.-Stand / config-level / Version:

0.1

Datum / date:

30.10.1998

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