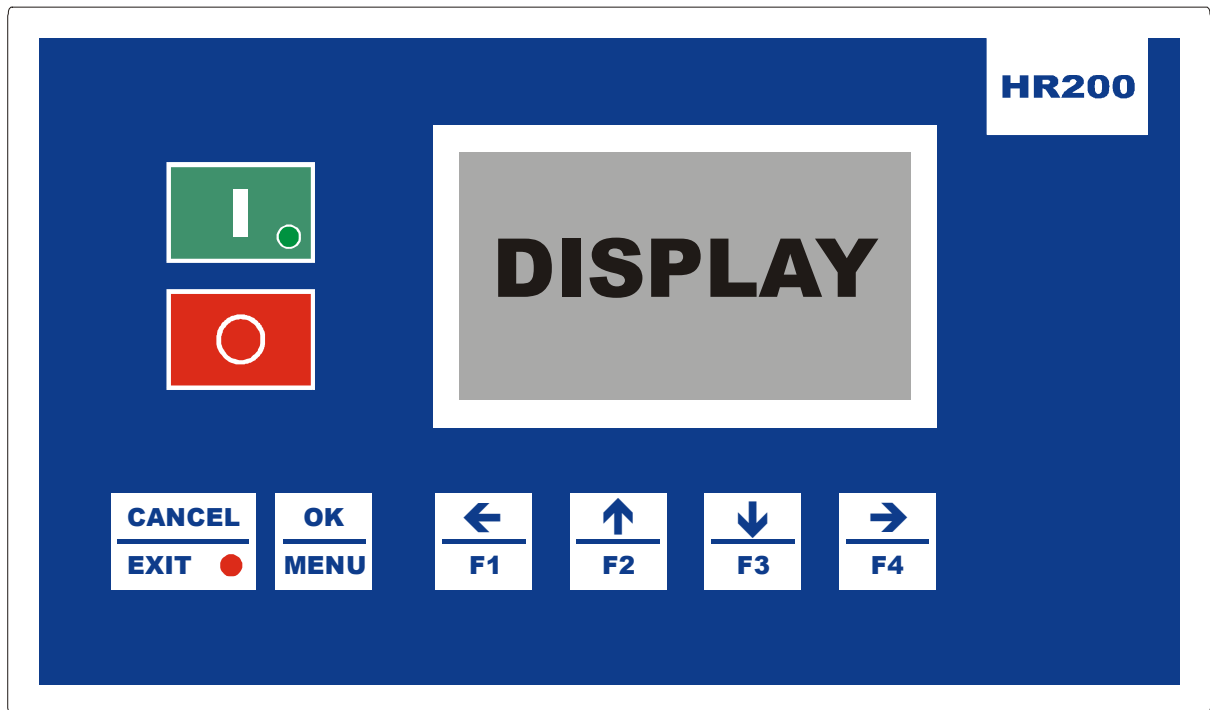# RITZ / Turbine controls

The control/display unit has a CPU, an LCD display and 8 keys. 2 LEDs also display particular operational conditions (e.g. plant ON, faults, warnings, "code broken" etc.).

1) Display:

1.1) Basic display

In Line 1, the actual rotations are shown on the left while the actual power is displayed on the right. The line below displays the actual flow on the left and the actual power on the right (but only when the relevant analogue value has been configured; see: Pos. 3.4 / menu "configuration").

```
  0/min    |    0.0A
  0m3/h    |    0.00kW
AUTO       START
  T-AUF  B-ZU  N   K


```

If the signal on an analogue input is lower than 3mA, the corresponding position will flash and an error message will be generated.
The 3rd line shows the plant mode (Auto/Manual, Start/Stop).
If "remote control" is activated, an "F"* appears at the end of the line.
The 4th line shows the outlets which are currently switched on.
In front of the display of both valves ("T" = Turbine / "B" = Bypass) you can see whether a final position has been reached ("_" = ON / "^" = OFF).
The 5th line displays faults and warnings.
In "Manual" mode, the lower edge of the LCD shows the current configuration of the function keys; otherwise the date and time are displayed here.

[* F = Fernbedienung = remote control]

1.2) Submenus

In different submenus target values can be given, for example, and different operational data can be retrieved. The "Main Menu" is called up using the MENU key.

A code query appears first:

```
►CODE:        0000
```

For parameters which are protected by code, the appropriate code must first be entered, so that the parameter can be changed, otherwise the parameters can only be displayed.

Codes are entered using the arrow keys (F1...F4).
The code is accepted by pressing the OK key.

Codes used: Code_1 = 0013   (general code)
                                  Code_2 = xxxx   (special Ritz code!)

2) Keys / LEDs:

I	"Manual" mode: activate network protection
O	{No function here}
CANCEL / EXIT	Acknowledge fault / Exit menu / Reject input
OK / MENU	Call up menu / Select position / Accept input
F1 ... F4	The allocation of each of these keys is shown
[Green LED]	(On the I key) lights up when in "Automatic" mode, flashes when in "Manual" mode;
[Red LED]	- Flashes when a fault/warning appears; - Lights up when all faults/warnings have been acknowledged, but not yet repaired, or if a code is currently (still) broken (i.e. active);

3) Menu management:

Press MENU key => after the request for a code, you reach the main menu.
Now you can use the arrow keys (F2/F3) to scroll up or down the menu options:
(► = cursor)

```
MAIN MENU:
►Parameter START
 Parameter STOP
 Delay times
 Configuration
 Time / date
 Operating hours
 Diagnose
 Error memory
```

Use the OK key to accept the desired menu point.
Use the EXIT key to return to the basic display.

A "broken" code remains active for max. 15 minutes, or until another code
is entered (input > 0).

Submenus, general information:
Use the arrow keys (F1...F4) to select the desired position. If the OK key is pressed, the cursor jumps to the right to the corresponding variables. The desired value can now be entered using the arrow keys (F1...F4) and then accepted using the OK key. The CANCEL key rejects the entry. Return to the main menu using the EXIT key.

3.1) Parameter START   (Only edit if "Code_1" has already been input!)

```
PARAM. START
►Impulse 1:      5s
 Pause 1:       10s
 Impulse 2:      5s
 Pause 2:       10s
 Threshold:   SPEED
```

Impulse (turbine open) up to switching threshold
Pause   (turbine open) up to switching threshold
Impulse (turbine open) from switching threshold
Pause   (turbine open) from switching threshold
Value for evaluating the switching threshold
                        [Speed / Flow / Power]

3.2) Parameter STOP   (Only edit if "Code_1" has already been input!)

```
PARAM. STOP
►Impulse 1:      5s
 Pause 1:       10s
 Impulse 2:      5s
 Pause 2:       10s
 Threshold:   SPEED
```

Impulse (turbine closed) up to switching threshold
Pause   (turbine closed) up to switching threshold
Impulse (turbine closed) from switching threshold
Pause   (turbine closed) from switching threshold
Value for evaluating the switching threshold
                        [Speed/ Flow / Power]

3.3) Delay times   (Only edit if "Code_1" has already been input!)

```
DELAY TIMES
►Compensation ON: 5s
 Power supply:     5s
 Freq. monitoring: 5s
 UPS warning:      5s

 Turbine open:    60s
 Turbine closed:  60s
 Turb. torque OPEN:   0s
 Turb. torque CLOSED: 0s
 Turbine temp:     0s
 Bypass open:     60s
 Bypass closed:   60s
 By. torque OPEN: 0s
 By. torque CLOSED:0s
 Bypass temp.:     0s
 Forced operation: 0h
```

Delay: compensation ON   [0-999]
Delay: power supply fault   [0-999]
Delay: frequency monitoring fault   [0-999]
Delay: UPS warning   [0-60]

Max time until response "Turbine Open"   [0-999]
Max time for response "Turbine Closed" [0-999]
Delay: turbine torque open fault [0-999]
Delay: turbine torque closed fault   [0-999]
Delay: turbine temp. monitoring fault [0-999]
Max. time until response "Bypass Open"   [0-999]
Max. time for response "Bypass Closed" [0-999]
Delay: bypass torque open fault [0-999]
Delay: bypass torque closed fault   [0-999]
Delay: bypass temp. monitoring fault [0-999]
Interval for forced operation of the valve   [0-24]

3.4) Configuration (Only edit if "Code_2" has already been input!)

```
CONFIGURATION
▶Speed       AE1
 Flow        AE2
 Power       AE3
 Output      AE4
 Language:   GERMAN
 RS485 remote control: NO
```

Configuration of analogue input 1
Configuration of analogue input 2
Configuration of analogue input 3
Configuration of analogue input 4
Dialogue language (German, English)
Remote control via RS485 (e.g. Profibus)

3.4.1) Configuration speed AE1 (Only edit if "Code_2" has already been input!)

```
CONFIGURATION SPEED
▶Value   4mA:     0/min
 Value 20mA:  6000/min
 Start threshold: 0/min
 Stop threshold: 0/min
 Max speed:      0/min
 Offset:         0/min
```

Speed at value = 4mA
Speed at value = 20mA
Switching threshold for start-up process
Switching threshold for stopping process
Threshold for "Max Speed" fault
Offset for the "Speed" value

3.4.2) Configuration flow AE2 (Only edit if "Code_2" has already been input!)

```
CONFIGURATION FLOW
▶Value   4mA:    0m3/h
 Value 20mA:   999m3/h
 Start threshold: 0m3/h
 Stop threshold: 0m3/h
 Offset:       0.0m3/h
```

Flow at value = 4mA
Flow at value = 20mA
Switching threshold for start-up process
Switching threshold for stopping process
Offset for the "Flow" value

3.4.3) Configuration power AE3 (Only edit if "Code_2" has already been input!)

```
CONFIGURATION POWER
▶Value   4mA:     0.0A
 Value  20mA:   400.0A
 Start threshold:0.0A
 Stop threshold: 0.0A
 Offset:        0.00A
```

Power at value = 4mA
Power at value = 20mA
Switching threshold for start-up process
Switching threshold for stopping process
Offset for the "Power" value

3.4.4) Configuration output AE4   (Only edit if "Code_2" has already been input!)

```
CONFIGURATION OUTPUT
▶Value    4mA:   0.00kW      Output at value =  4mA
 Value 20mA: 200.00kW        Output at value = 20mA
 Offset:       0.00kW        Offset for the "output" value
```

General info: If the value 0 is entered in the parameter "Value 20mA", the
corresponding value in the basic display will be hidden!

3.5) Time / date   (Only edit if "Code_1" has already been input!)

```
TIME / DATE
▶Date: Thurs 02.07.2009
 Time:   09:55:10
 Date format:      0      [0 = DD.MM.YY, 1 = MM/DD/YY, 2 = YY/MM/DD]
                          (DD: day, MM: month, YY: year)
```

3.6) Operating hours   (Only edit if "Code_2" has already been input!)

```
OPERATING HOURS
▶Plant:        0 h          Operating hours – plant
```

3.7) Diagnostics

```
DIAGNOSTICS
▶Lamps test         0     Lamps test switch on/off
 Turbine V:      1.20      Current programme version

 A-Inp.1:     0.00mA       Analogue input 1 (speed)
 A-Inp.2:     0.00mA       Analogue input 2 (flow)
 A-INP.3:     0.00mA       Analogue input 3 (power)
 A-INP.4:     0.00mA       Analogue input 4 (output)
 D-INP:  0000 0000         Status of digital inputs   )_  MK20-GR
 D-OUT:  0000 0000         Status of digital outputs  )   (basic unit)
 INP-4:  0000 0000         Status of digital inputs   )_  MK200-8E/4R
 OUT-4:  0000 0000         Status of digital outputs  )   (address: 4)
```

The "Lamps Test" function can be used to switch the LEDs on and off and to test the multiple error message relay.

The remaining positions are only intended for internal test purposes!

3.8) Error memory

```
 ERROR MEMORY
►POWER FAILURE        00.00.00      Date of the last power failure (shutdown)
 POWER SUPPLY         00.00.00      Date of the last "Power Supply" fault
 FREQ.MONITORING      00.00.00      Date of the last "Frequency Monitoring" fault

 TURB. TORQUE OPEN    00.00.00      Date of the last "Torque Open" fault
 TURB. TOQRUE CLOSED  00.00.00      Date of the last "Torque Closed" fault
 TURBINE TEMPERATURE  00.00.00      Date of the last "Temperature" fault
 TURBINE NOT OPEN     00.00.00      Date of the last "Not Open" fault
 TURBINE NOT CLOSED   00.00.00      Date of the last "Not Closed" fault

 BYPASS TORQUE OPEN   00.00.00      Date of the last "Torque Open" fault
 BYPASS TORQUE CLOSED 00.00.00      Date of the last "Torque Closed" fault
 BYPASS TEMPERATURE   00.00.00       Date of the last "Temperature" fault
 BYPASS NOT OPEN      00.00.00      Date of the last "Not Open" fault
 BYPASS NOT CLOSED    00.00.00      Date of the last "Not Closed" fault
 E/A–MODULE ADR.4     00.00.00      Date of the last "MK200-Module" fault

 SPEED SENSOR         00.00.00      Date of the last "Speed Sensor" fault
 FLOW SENSOR          00.00.00      Date of the last "Flow Sensor" fault
 POWER SENSOR         00.00.00      Date of the last "Power Sensor" fault
 OUTPUT SENSOR        00.00.00      Date of the last "Output Sensor" fault

 MAX SPEED            00.00.00      Date of the last "Max Speed" fault

 UPS WARNING          00.00.00      Date of the last "UPS Warning" message
```

4) Faults

"Undervoltage!"   Undervoltage means that the mains voltage has dropped
                               below approx. 180Vac. This threshold depends on the
                               transformer used!

When the "undervoltage" fault appears, the control's supply voltage must be switched
on and off once briefly, so that this fault is acknowledged. All other faults
can be acknowledged with the **CANCEL** *key.*

"EEPROM faulty!"   The EEPROM for saving the default settings and the
                               adjustment parameters for the analogue inputs is
                               defective! (Send the controls to be repaired)

"E/A-Module 04 fault"   The extension module "MK200-8E/4RA" with the
                               Address 4 is not responding!
                               (Check connection cable or module!)

"Power supply fault"   The signal on digital input 4 (HR200) has dropped
                               for longer than the preset delay time!

"Frequency fault"   The signal on digital input 5 (HR200) has dropped
                               for longer than the preset delay time, when the
                               output "Network Protection" (HR200) is active!

"Turb. not OPEN fault"   The signal "Turbine Open" on digital input 6
                               (HR200) has still not appeared after the max time
                               allowed when opening the turbine valves.

"Turb. not closed fault"   The signal "Turbine Closed" on digital input 7
                               (HR200) has still not appeared after the max time
                               allowed when closing the turbine valves.

"Turb. torque OPEN fault"   The signal "Turbine Torque Open" on digital
                               input 1 (MK200-8E4RA) has dropped for longer than
                               the preset delay time when the turbine valves are
                               opened!

"Turb. torque CLOSED fault"   The signal "Turbine Torque Closed" on digital
                               input 2 (MK200-8E4RA) has dropped for longer than the
                               preset delay time when the turbine valves are
                               closed!

Turb. temp. fault"   The signal "Turbine Temperature" on digital input 3
                               (MK200-8E4RA) has dropped for longer than the preset
                               delay time!

"Bypass not OPEN fault"   The signal "Bypass Open" on digital input 4
                               (MK200-8E4RA) has still not appeared after the
                               max time allowed when opening the bypass valves.

"By. not CLOSED fault"	The signal "Bypass Closed" on digital input 5 (MK200-8E4RA) has still not appeared after the max time allowed when closing the bypass valves.
"By. torque OPEN fault"	The signal "Bypass Torque Open" on digital input 6 (MK200-8E4RA) has dropped for longer than the preset delay time when opening the bypass valves!
"By. torque CLOSED"	The signal "Bypass Torque Closed" on digital input 7 (MK200-8E4RA) has dropped longer than the preset delay time when closing the bypass valves!
"By. temp. fault"	The signal "Turbine Temperature" on digital input 8 (MK200-8E4RA) has dropped for longer than the preset delay time!
"Speed sensor fault"	The signal on analogue input 1 (HR200 / 4-20mA) is outside the permitted range. (Check speed sensor or cabling)
"Flow sensor fault"	The signal on analogue input 2 (HR200 / 4-20mA) is outside the permitted range. (Check flow sensor or cabling)
"Power sensor fault"	The signal on analogue input 3 (HR200 / 4-20mA) is outside the permitted range. (Check power sensor or cabling)
"Output sensor fault"	The signal on analogue input 4 (HR200 / 4-20mA) is outside the permitted range. (Check output sensor or cabling)
"Max speed fault"	The speed has exceeded the programmed "Max Speed" threshold (see Pos. 3.4.1) and a threshold of "0" has been programmed.

For the sensor faults, only the analogue inputs whose values have been configured (see: Pos. 3.4.x / "Value 20mA") are monitored.

"Warning: UPS"	The signal on digital input 8 (HR200) has dropped for longer than the preset delay time!

This warning message will not lead to a shutdown!

5) Programme sequence

5.1) "MANUAL" mode   (HR200, input 1 = 1)

In this mode the function keys (HR200, F1, F4) can be used manually to open or close the valves and the bypass valves.
Using the I key (HR200) the "Network Protection" output can be keyed in
(i.e. the output is on, as long as the I key is pressed).
The "compensation" output is not controlled here.

5.2) "AUTOMATIC" mode   (HR200, input 2 = 1)

If the "external release" signal is applied (HR200, input 3 = 1), the "start-up process" will then be activated.
If the "external release" signal drops again, or if a fault appears, the "stopping process" will be activated.

5.2.1) Start-up process   (see: Pos. 3.1 / Parameter Start)

There should be no faults pending!
First the output "open turbine valves" (MK200-8E4RA, output 1) will be controlled via an impulse/pause control with the "Impulse 1 / Pause 1" values.

If the selected value exceeds the preset threshold (see: Pos. 3.4.x / "Start Threshold"), the "network protection" output (HR200, output 1) will be switched on and the delay time for the compensation will be started (see: Pos. 3.3 / "Compensation ON"). If the value "0" is programmed as the "Start Threshold" value, the start-up process will begin immediately with the values for "Impulse 2 / Pause 2".

Now the "Open Turbine Valves" output will be controlled by an impulse/pause control with the "Impulse 2 / Pause 2" values.

After the expiry of the delay time for the compensation the "Compensation" output (HR200, output 2) is switched on.

As soon as the "Open Turbine Valves" signal appears (HR200, input 6 = 1), the "Open Turbine Valves" output is no longer controlled.

5.2.2) Stopping process   (see: Pos. 3.2 / Parameter Stop)

First the output "Compensation" is switched off, and the output "Close Turbine Valves" (MK200-8E4RA, output 2) is controlled via an impulse/pause control with the values "Impulse 1 / Pause 1".

If the selected value falls below the preset threshold (see: Pos. 3.4.x / "Threshold Stop"), the "Network Protection" output (HR200, output 1) is switched off. If the value "0" is programmed as the "Threshold Stop", the stopping process will be immediately begun with the values "Impulse 2 / Pause 2".

The output "Close Turbine Valves" will now be controlled via an impulse/pause control with the values "Impulse 2 / Pause 2".

As soon as the signal "Turbine Valves Closed" appears (HR200, input 7 = 1), the output "Close Turbine Valves" is no longer controlled.
.

5.2.3) Bypass

For "Fault" and "External Release = 1" the output "Open Bypass Valves" (MK200-8E4RA, output 3) is controlled, otherwise the output "Close Bypass Valves" (MK200-8E4RA, output 4) is controlled.

5.2.4) Forced operation of the valves   (Turbine and Bypass)

If the plant is in "Automatic Stop" mode, and the valves (Turbine and Bypass) are not controlled for at least the "Forced Operation" time (see Pos. 3.3), the valves will open once completely and then close again completely. If the parameter "Forced Operation" is programmed to "0", the forced operation is deactivated.

5.3) "OFF" mode   (HR200, input 1+2 = 0)

If neither "Manual" nor "AUTOMATIC" mode is selected, the plant will be in "OFF" mode.

If during operation the plant switches from "AUTOMATIC" mode to "OFF" mode, the "Stopping Process" is initiated (see: Pos. 5.2.2).

5.4) "Remote control via RS485" mode   (e.g. Profibus connection)

The mode "Remote Control via RS485" is only possible if the plant is switched via the digital inputs of the control to "Automatic – Periphery" (HR200, Input 2 = 1).

If the mode "Remote Control via RS85" is activated (see: Pos. 3.4), and the mode "Automatic" is selected via the remote control (1.Byte, Bit 0 = 1), then the plant Start or Stop will no longer be done via the "External Release" input (HR200, input 3), but by the remote control (1.Byte, Bit 2).

If the "Remote Control via RS85" is activated, and the "Manual Mode" is selected by remote control (1.Byte, Bit 1 = 1), then the individual valves can be opened/closed via the interface, and the network protection can be switched on/off (for configuration of the individual signals see document "AListe_Turbine_v121.pdf").

If the "Remote Control RS485" mode is activated, and neither "Automatic" nor "Manual" mode is selected via remote control (1.Byte, Bit 0 = 0 and Bit 1 = 0), the digital input "External Release" (HR200, Input 3) can be used to either stop or start the plant again.

If the "Remote Control via RS85" mode is activated, and if the "Automatic" and "Manual" modes are selected by remote control (1.Byte, Bit 0 = 1 and Bit 1 = 1), the plant will switch to "OFF" mode!

In the event of a communication failure (Timeout) the symbol "F" will flash in the extreme right of the 3rd line of the basic display. In this case the plant will be switched back to "Periphery Operation" (HR200).

6) Connections / terminals   =>   Basic unit (MK20-GR / HR200)

Term. 1	0V ac	
Term. 2	18V ac	**Power supply**
Term. 3	Protective earth (PE) connection	
Term. 4	RS485 (+)	
Term. 5	RS485 (-)	**Interface**
Term. 6	RS485 earth	
Term. 7	Sensor voltage for analogue input 1	
Term. 8	Analogue input 1 (4-20mA),	**Speed**
Term. 9	Sensor voltage for analogue input 2	
Term. 10	Analogue input 2 (4-20mA)	**Flow**
Term. 11	Sensor voltage for analogue input 3	
Term. 12	Analogue input 3 (4-20mA)	**Power**
Term. 13	Sensor voltage for analogue input 4	
Term. 14	Analogue input 4 (4-20mA)	**Output**
Term. 15	Sensor voltage 24Vdc	
Term. 16	Dig. input 1	**Manual**
Term. 17	Sensor voltage 24Vdc	
Term. 18	Dig. input 2	**Automatic**
Term. 19	Sensor voltage 24Vdc	
Term. 20	Dig. input 3	**External release (1=Start)**
Term. 21	Sensor voltage 24Vdc	
Term. 22	Dig. input 4	**Loss of voltage (1=ok)**
Term. 23	Sensor voltage 24Vdc	
Term. 24	Dig. input 5	**Frequency monitoring (1=ok)**
Term. 25	Sensor voltage 24Vdc	
Term. 26	Dig. input 6	**Turbine valves open**
Term. 27	Sensor voltage 12Vdc	
Term. 28	Dig. input 7	**Turbine valves closed**
Term. 29	Sensor voltage 12Vdc	
Term. 30	Dig. input 8	**UPS warning (1=ok)**
Term. 31	Relay output 1 COM	**Network protection**
Term. 32	Relay output 1 NO	
Term. 33	Relay output 2 COM	**Compensation**
Term. 34	Relay output 2 NO	
Term. 35	Relay output 3 COM	(Reserve)
Term. 36	Relay output 3 NO	
Term. 37	Relay output 4 COM	**Ready for operation**
Term. 38	Relay output 4 NO	
Term. 39	Relay output 5 COM	**RESET**
Term. 40	Relay output 5 NO	
Term. 41	Relay output 6 COM	
Term. 42	Relay output 6 NC	**Collective faults (1=ok)**
Term. 43	Relay output 6 NO	

Interface for MK200 module:

Term. 44   RS485 (-)
Term. 45   RS485 (+)
Term. 46   GNDX
Term. 47   0V ac
Term. 48   18V ac

Bedeutung Jumper J1:

  RS485-Schnittstelle ohne Abschlußwiderstand

  RS485-Schnittstelle mit Abschlußwiderstand

[RS485 interface without terminating resistor
RS485 interface with terminating resistor]

CAUTION: For cable lengths of more than 30m (digital signals) coupling relays must be used!
Shielded cables must be used for the analogue signals!

7) Connections / terminals =>   Module MK200-8E/4Rout   (Address: 4)

Term. 1   Dig. input 1, turbine valves torque open   (1=ok)

Term. 2   Dig. input 2, turbine valves torque closed   (1=ok)

Term. 3   Dig. input 3, turbine valves temperature monitoring   (1=ok)

Term. 4   Dig. input 4, bypass valves open   (1=open)
Term. 5   Dig. input 5, bypass valves closed   (1=closed)
Term. 6   Dig. input 6, bypass valves torque open   (1=ok)

Term. 7   Dig. input 7, bypass valves torque closed   (1=ok)

Term. 8   Dig. input 8, bypass valves temperature monitoring   (1=ok)

Term. 9   +24Vdc (supply voltage for inputs)

Term. 12   _ Relay output 1, open turbine valves
Term. 13   /
Term. 14   _ Relay output 1, close turbine valves
Term. 16   /
Term. 18   _ Relay output 1, open bypass valves
Term. 19   /
Term. 20   _ Relay output 1, close bypass valves
Term. 22   /

CAUTION: Coupling relays must be used for cables longer than 30m!

8) Setting the module address for the MK200 modules

The MK200 module addresses are set using the DIP switches, which can be accessed from the right-hand side of the module. The opening is closed with a cover, which must be removed first.

DIP switch for setting addresses (address 1 shown here)

The module addresses are set with the first 5 DIP switches.

Address	DIP switches 1 2 3 4 5
1	1 0 0 0 0
2	0 1 0 0 0
3	1 1 0 0 0
4	**0 0 1 0 0**
5	1 0 1 0 0
6	0 1 1 0 0
7	1 1 1 0 0

0 = OFF (down)
1 = ON   (up)

The DIP switches 6 - 8 are reserved and must always be OFF, i.e. in the down position.

The DIP switches 9 and 10 switch the interface's terminating resistors.
These are normally deactivated (OFF = down).

9) Uploading a new programme to the controls

The controls must first be switched to programme mode:

a) Switch off the control's power supply;

b) Press the "**0**" and "F1" keys together to switch the power supply
on again.

=> "**FLASH load**" now appears on the display

c) The relevant programme (HEX file) can now be transferred to the controls using the
PC software ("RSI Flash Programming").

=> Launch PC programme
=> [Open] .... Select programme file;
=> [Burn] .... Change interface if needed // Baud rate always 19200!
=> [OK] ....Launch programming;

d) If the PC programme reports "Transfer successful", the power supply must be quickly
switched on and off again.

=> The basic display should now be shown again.