HB-THERM®

Test Program for a Profibus connection Thermo-5 to Siemens S7-300

Contents

1 Introduction

This example of use assumes knowledge in the programming language STEP 7 with Profibus and in the operation of a Thermo-5 temperature control unit. This test program can be used for only a Thermo-5 temperature control unit.

The following instruction manuals provide further details:

- Instruction Manual of Thermo-5 temperature control units
- Profibus – Interface for Thermo-5 (O8316-X, X=language)

2 Content

STEP 7 projects include a S7-300 with one CPU 315-2 DP and Thermo-5 temperature control unit. The communication is implemented via Profibus-DP (Master-Slave).
There exist the following examples:

- 1 Thermo-5 Unit: HB-THERM_K1M1_jjmm.ZIP [1)]
- 4 Thermo-5 Units: HB-THERM_K4M1_jjmm.ZIP [1) 2)]
- 16 Thermo-5 Units: HB-THERM_K4M4_jjmm.ZIP [1) 3)]

The projects must be unzipped in the SIMATIC Manager.

Note:

The test program was initially checked on the following Siemens S7 hardware versions:

- CPU 315-2 DP 6ES7 315-2AH14-0AB0

There is no guarantee for proper function of the test program in case of other Siemens S7 hardware versions. If there are problems by using hardware versions not listed above, please contact the Siemens Support Office directly.

3 STEP-7 Projects

3.1 Insert CPU 315-2 DP

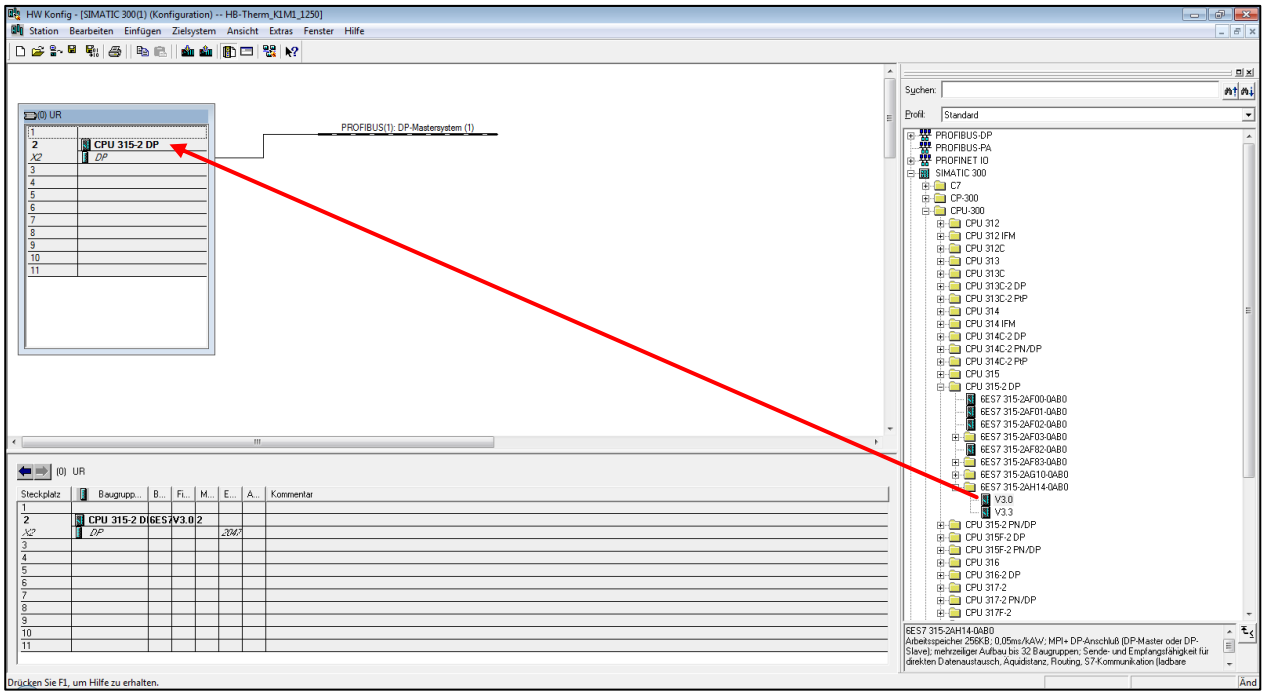

Figure 1: Insert CPU 315-2DP

[1] jjmm = version, K_ = Number of Profibus node, M_ = Number of devices per module Profibus node

[2] 1 Single unit with 3 Modular Units

[3] 1 Single Unit with 15 Modular Units

3.2 GSD-File installed

If you already work with an existing GSD-file, please check under www.hb-therm.ch if the version matches with the actual one. If not, please replace it.

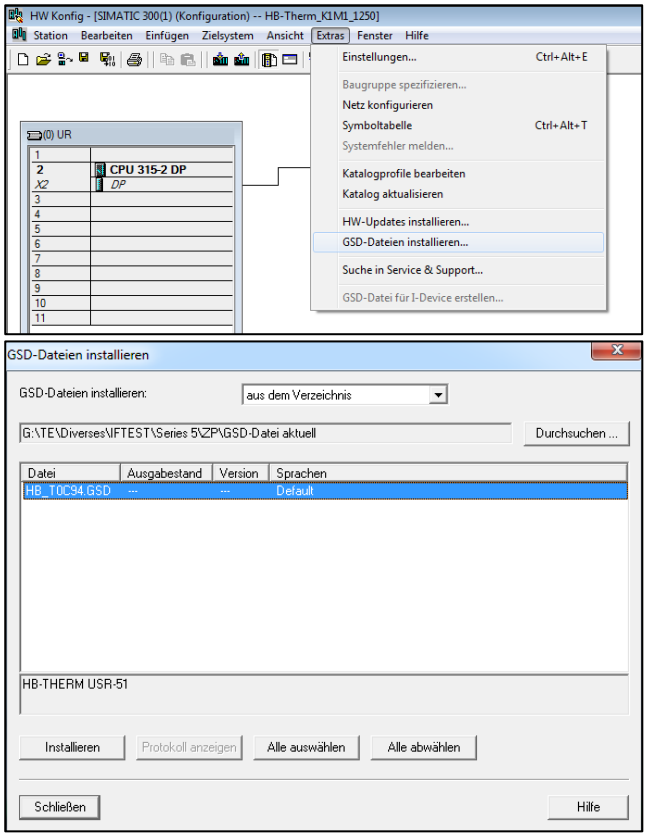

Figure 2: Install GSD.File

3.3 Insert the station HB-Therm USR-51 as DP-Slave

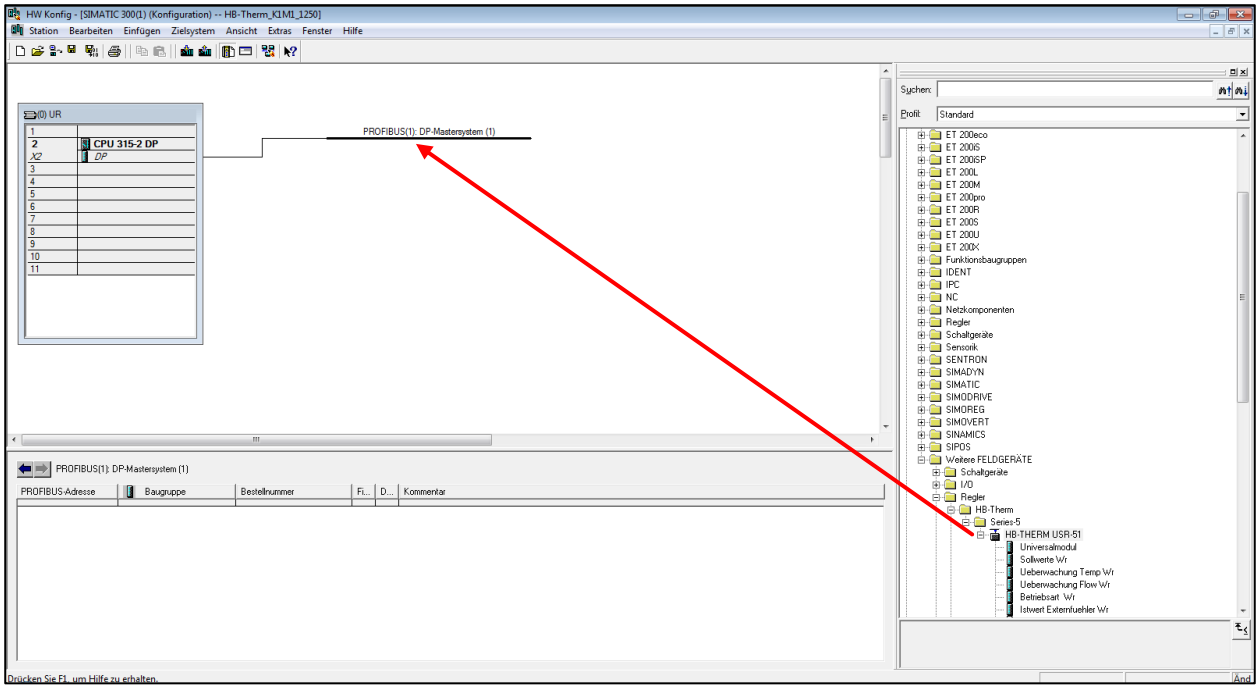

Figure 3: Insert station

3.4 Configure station

- Set the address of the slave (in this case no 5)
- Insert the object HB-THERM USR 51 and set the I/O address (in this case I/O after 256)

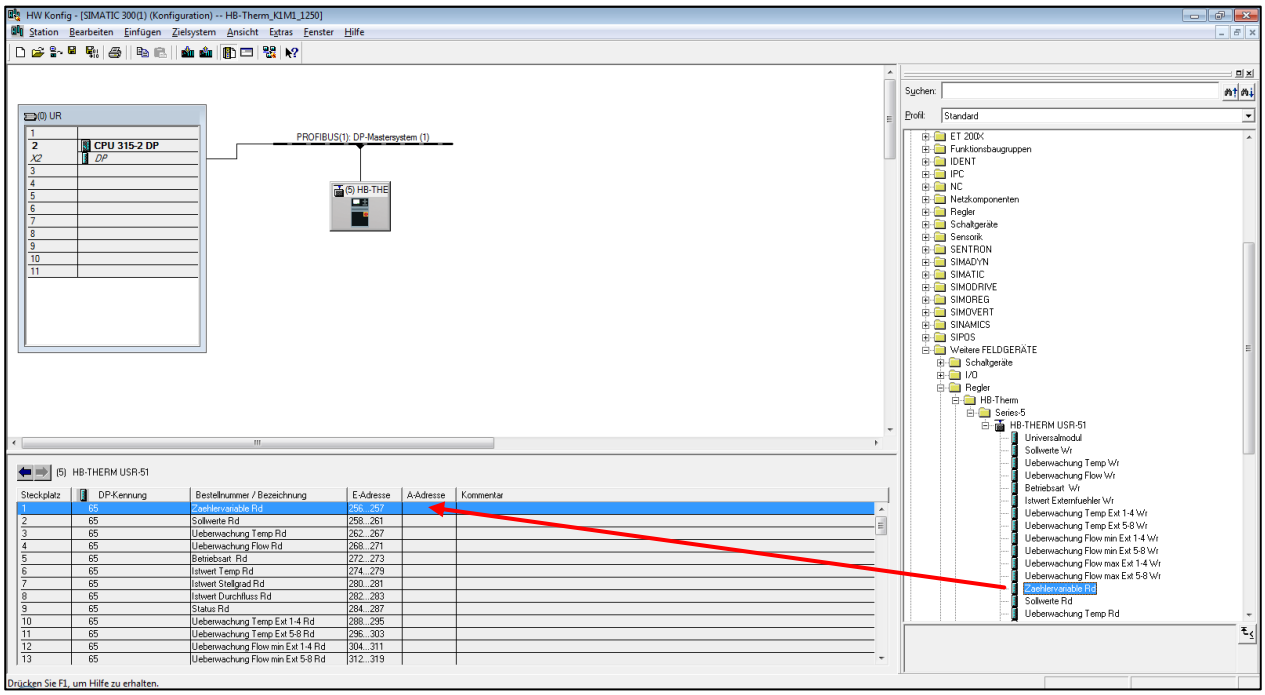

Figure 4: Settings

- The Value of ModulNumber must correspond to the Address of the unit you want to communicate with.
- For communication with multiple units over one Profibus Node the modules of the GSD-file are to implement several times.

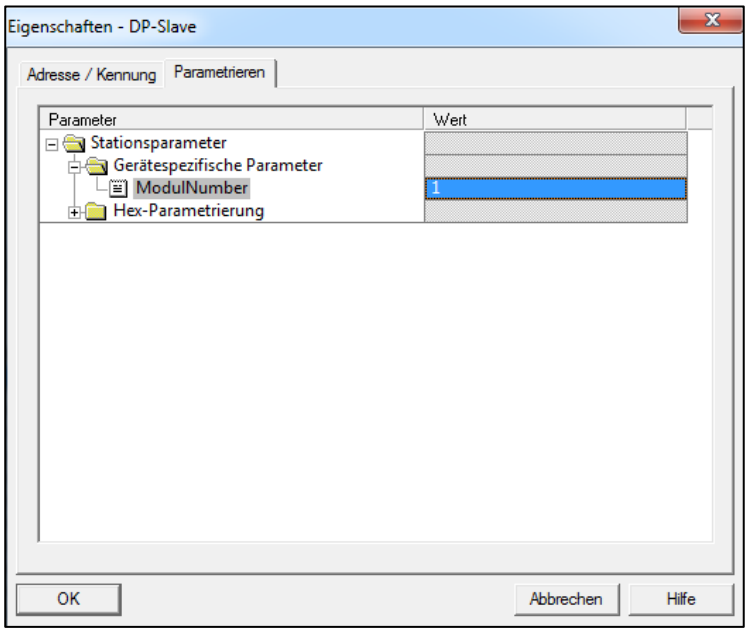

Figure 5: Configure station

3.5 Read the input ports

The data is read from the input ports and saved to the device DB11 for further processing.

```
OB1 :  "Main Program Sweep (Cycle)"
Kommentar:

Netzwerk 1: Reading intputs from HB-THERM
Kommentar:

// Counter variable poll
      L     PEW  256
      T     "DB11".Zaehlervariable            DB11.DBW0         -- Counter variable poll, Range 0 - ffffH

// Nominal value 1
      L     PEW  258
      T     "DB11".Sollwert_1                 DB11.DBW2         -- Nominal value 1, Unit 0,1°C, Range 0-4000

// Nominal value 2
      L     PEW  260
      T     "DB11".Sollwert_2                 DB11.DBW4         -- Nominal value 2, Unit 0,1°C, Range 0-4000

// Valid upper deviation nominal / actual value
      L     PEW  262
      T     "DB11".Abweichung_oben            DB11.DBW6         -- Valid upper deviation nominal / actual value, Unit 0,1K, Range 0-4000

// Valid lower deviation nominal / actual value
      L     PEW  264
      T     "DB11".Abweichung_unten           DB11.DBW8         -- Valid lower deviation nominal / actual value, Unit 0,1K, Range 0-4000

// Valid temperature difference main / return line
      L     PEW  266
      T     "DB11".Temp_Diff_Vor_Ruecklauf    DB11.DBW10        -- Valid temperature difference main / return line, Unit 0,1K, Range 0-4000

// Valid minimum flow rate
      L     PEW  268
      T     "DB11".Durchfluss_minimum         DB11.DBW12        -- Valid minimum flow rate, Unit L/min, Range 0 - 1000
// Valid maximum flow rate
      L     PEW  270
      T     "DB11".Durchfluss_maximum         DB11.DBW14        -- Valid maximum flow rate, Unit L/min, Range 0 - 1000

// Operating mode set (Bit-Values)
      L     PEW  272
      T     DB11.DBW   16

// Actual temperature main line
      L     PEW  274
      T     "DB11".Istwert_Vorlauf            DB11.DBW18        -- Actual temperature main line, Unit 0,1°C, Range 0-4000

// Actual temperature return line
      L     PEW  276
      T     "DB11".Istwert_Ruecklauf          DB11.DBW20        -- Actual temperature return line, Unit 0,1°C, Range 0-4000

// Actual temperature external sensor
      L     PEW  278
      T     "DB11".Istwert_extern             DB11.DBW22        -- Actual temperature external sensor, Unit 0,1°C, Range 0-4000

// Actual regulation ratio
      L     PEW  280
      T     "DB11".Stellgrad                  DB11.DBW24        -- Actual regulation ratio, Unit %, Range -100 - +100

// Actual flow rate
      L     PEW  282
      T     "DB11".Durchfluss                 DB11.DBW26        -- Actual flow rate, Unit L/min, Range 0 - 1000

// Status Operating mode (Bit-Values)
      L     PEW  284
      T     DB11.DBW   28
// Status alarms (Bit-Values)
      L     PEW  286
      T     DB11.DBW   30

// Temperatur Differnz Vorlauf Rücklauf Ext. 1-8
      L     PEW  288
      T     "DB11".Temp_Diff_VL_RL_Ext1       DB11.DBW32        -- Zulässige TempDiff Vor/Rücklauf ext.1, Unit 0,1 K, Range 0-4000

      L     PEW  290
      T     "DB11".Temp_Diff_VL_RL_Ext2       DB11.DBW34        -- Zulässige TempDiff Vor/Rücklauf ext.2, Unit 0,1 K, Range 0-4000

      L     PEW  292
      T     "DB11".Temp_Diff_VL_RL_Ext3       DB11.DBW36        -- Zulässige TempDiff Vor/Rücklauf ext.3, Unit 0,1 K, Range 0-4000

      L     PEW  294
      T     "DB11".Temp_Diff_VL_RL_Ext4       DB11.DBW38        -- Zulässige TempDiff Vor/Rücklauf ext.4, Unit 0,1 K, Range 0-4000
// Durchfluss minimum ext. 1-8
      L     PEW  304
      T     "DB11".Durchfluss_minimum_Ext1    DB11.DBW48        -- Durchfluss minimum ext. 1, Unit 0,1 L/min, Range 0-4000

      L     PEW  306
      T     "DB11".Durchfluss_minimum_Ext2    DB11.DBW50        -- Durchfluss minimum ext. 2, Unit 0,1 L/min, Range 0-4000

      L     PEW  308
      T     "DB11".Durchfluss_minimum_Ext3    DB11.DBW52        -- Durchfluss minimum ext. 3, Unit 0,1 L/min, Range 0-4000

      L     PEW  310
      T     "DB11".Durchfluss_minimum_Ext4    DB11.DBW54        -- Durchfluss minimum ext. 4, Unit 0,1 L/min, Range 0-4000
// Durchfluss maximum ext. 1-8
      L     PEW  320
      T     "DB11".Durchfluss_maximum_Ext1    DB11.DBW64        -- Durchfluss maximum ext. 1, Unit 0,1 L/min, Range 0-4000

      L     PEW  322
      T     "DB11".Durchfluss_maximum_Ext2    DB11.DBW66        -- Durchfluss maximum ext. 2, Unit 0,1 L/min, Range 0-4000

      L     PEW  324
      T     "DB11".Durchfluss_maximum_Ext3    DB11.DBW68        -- Durchfluss maximum ext. 3, Unit 0,1 L/min, Range 0-4000

      L     PEW  326
      T     "DB11".Durchfluss_maximum_Ext4    DB11.DBW70        -- Durchfluss maximum ext. 4, Unit 0,1 L/min, Range 0-4000
// Istwert Rücklauf Temperatur ext. 1-8
      L     PEW  336
      T     "DB11".Istwert_Ruecklauf_Ext1     DB11.DBW80        -- Istwert Rücklauf ext. 1, Unit 0,1 °C, Range 0-4000

      L     PEW  338
      T     "DB11".Istwert_Ruecklauf_Ext2     DB11.DBW82        -- Istwert Rücklauf ext. 2, Unit 0,1 °C, Range 0-4000

      L     PEW  340
      T     "DB11".Istwert_Ruecklauf_Ext3     DB11.DBW84        -- Istwert Rücklauf ext. 3, Unit 0,1 °C, Range 0-4000

      L     PEW  342
      T     "DB11".Istwert_Ruecklauf_Ext4     DB11.DBW86        -- Istwert Rücklauf ext. 4, Unit 0,1 °C, Range 0-4000
// Durchfluss ext. 1-8
      L     PEW  352
      T     "DB11".Durchfluss_Ext1            DB11.DBW96        -- Durchfluss ext. 1, Unit 0,1 L/min, Range 0-4000

      L     PEW  354
      T     "DB11".Durchfluss_Ext2            DB11.DBW98        -- Durchfluss ext. 2, Unit 0,1 L/min, Range 0-4000

      L     PEW  356
      T     "DB11".Durchfluss_Ext3            DB11.DBW100       -- Durchfluss ext. 3, Unit 0,1 L/min, Range 0-4000

      L     PEW  358
      T     "DB11".Durchfluss_Ext4            DB11.DBW102       -- Durchfluss ext. 4, Unit 0,1 L/min, Range 0-4000

      L     PEW  360
      T     "DB11".Durchfluss_Ext5            DB11.DBW104       -- Durchfluss ext. 5, Unit 0,1 L/min, Range 0-4000

      L     PEW  362
      T     "DB11".Durchfluss_Ext6            DB11.DBW106       -- Durchfluss ext. 6, Unit 0,1 L/min, Range 0-4000

      L     PEW  364
      T     "DB11".Durchfluss_Ext7            DB11.DBW108       -- Durchfluss ext. 7, Unit 0,1 L/min, Range 0-4000

      L     PEW  366
      T     "DB11".Durchfluss_Ext8            DB11.DBW110       -- Durchfluss ext. 8, Unit 0,1 L/min, Range 0-4000
```

Figure 6: Read the input ports

3.5.1 Device DB11

Address space assignment of the input ports

Adresse	Name	Typ	Anfangswert	Kommentar
0.0		STRUCT		
+0.0	Zaehlervariable	WORD	W#16#0	Counter variable poll, Range 0 - ffffH
+2.0	Sollwert_1	INT	0	Nominal value 1, Unit 0,1°C, Range 0-4000
+4.0	Sollwert_2	INT	0	Nominal value 2, Unit 0,1°C, Range 0-4000
+6.0	Abweichung_oben	INT	0	Valid upper deviation nominal / actual value, Unit 0,1K, Range 0-4000
+8.0	Abweichung_unten	INT	0	Valid lower deviation nominal / actual value, Unit 0,1K, Range 0-4000
+10.0	Temp_Diff_Vor_Ruecklauf	INT	0	Valid temperature difference main / return line, Unit 0,1K, Range 0-4000
+12.0	Durchfluss_minimum	INT	0	Valid minimum flow rate, Unit L/min, Range 0 - 1000
+14.0	Durchfluss_maximum	INT	0	Valid maximum flow rate, Unit L/min, Range 0 - 1000
+16.0	BA_Alarm_Reset	BOOL	FALSE	Operating mode: Alarm reset (for acknowledging P- / M-alarms)
+16.1	BA_Bit_9_Reserve	BOOL	FALSE	Operating mode: Bit 9 Reserve
+16.2	BA_Bit_10_Reserve	BOOL	FALSE	Operating mode: Bit 10 Reserve
+16.3	BA_Bit_11_Reserve	BOOL	FALSE	Operating mode: Bit 11 Reserve
+16.4	BA_Bit_12_Reserve	BOOL	FALSE	Operating mode: Bit 12 Reserve
+16.5	BA_Bit_13_Reserve	BOOL	FALSE	Operating mode: Bit 13 Reserve
+16.6	BA_Bit_14_Reserve	BOOL	FALSE	Operating mode: Bit 14 Reserve
+16.7	BA_Watchdog	BOOL	FALSE	Operating mode: Watchdog
+17.0	BA_Geraet_Ein_Aus	BOOL	FALSE	Operating mode: Unit ON/OFF
+17.1	BA_Abkuehlen_Ein_Aus	BOOL	FALSE	Operating mode: Cooling ON/OFF
+17.2	BA_Formentleerung_Ein_A	BOOL	FALSE	Operating mode: Mould evacuation ON/OFF
+17.3	BA_Leckstopbetrieb_Ein_A	BOOL	FALSE	Operating mode: Leak stopper ON/OFF
+17.4	BA_Externfuehler_Ein_Aus	BOOL	FALSE	Operating mode: External sensor ON/OFF
+17.5	BA_2_Sollwert_Ein_Aus	BOOL	FALSE	Operating mode: 2nd nominal value ON/OFF
+17.6	BA_Bit_6_Reserve	BOOL	FALSE	Operating mode: Bit 6 Reserve
+17.7	BA_Bit_7_Reserve	BOOL	FALSE	Operating mode: Bit 7 Reserve
+18.0	Istwert_Vorlauf	INT	0	Actual temperature main line, Unit 0,1°C, Range 0-4000
+20.0	Istwert_Ruecklauf	INT	0	Actual temperature return line, Unit 0,1°C, Range 0-4000
+22.0	Istwert_extern	INT	0	Actual temperature external sensor, Unit 0,1°C, Range 0-4000
+24.0	Stellgrad	INT	0	Actual regulation ratio, Unit %, Range -100 - +100
+26.0	Durchfluss	INT	0	Actual flow rate, Unit L/min, Range 0 - 1000
+28.0	SBA_Sammelalarm_Prozess	BOOL	FALSE	Status operating mode: Common alarm Process (P)
+28.1	SBA_Sammelalarm_Geraet	BOOL	FALSE	Status operating mode: Common alarm Unit (M)
+28.2	SBA_Sammelalarm_Bedien	BOOL	FALSE	Status operating mode: Common alarm Operation (B)
+28.3	SBA_Bit_11_Reserve	BOOL	FALSE	Status operating mode: Bit 11 Reserve
+28.4	SBA_Bit_12_Reserve	BOOL	FALSE	Status operating mode: Bit 12 Reserve
+28.5	SBA_Bit_13_Reserve	BOOL	FALSE	Status operating mode: Bit 13 Reserve
+28.6	SBA_Bit_14_Reserve	BOOL	FALSE	Status operating mode: Bit 14 Reserve
+28.7	SBA_Bit_15_Reserve	BOOL	FALSE	Status operating mode: Bit 15 Reserve
+29.0	SBA_Geraet_Ein_Aus	BOOL	FALSE	Status operating mode: Unit ON/OFF
+29.1	SBA_Abkuehlen_Ein_Aus	BOOL	FALSE	Status operating mode: Cooling ON/OFF
+29.2	SBA_Formentleerung_Ein_A	BOOL	FALSE	Status operating mode: Mould evacuation ON/OFF
+29.3	SBA_Leckstopbetrieb_E_A	BOOL	FALSE	Status operating mode: Leak stopper ON/OFF
+29.4	SBA_Externfuehler_Ein_A	BOOL	FALSE	Status operating mode: External sensor ON/OFF
+29.5	SBA_2_Sollwert_Ein_Aus	BOOL	FALSE	Status operating mode: 2nd nominal value ON/OFF
+29.6	SBA_Fernsteuerbetrieb_EA	BOOL	FALSE	Status operating mode: Remote control operation ON/OFF
+29.7	SBA_Bit_6_Reserve	BOOL	FALSE	Status operating mode: Bit 6 Reserve
+30.0	SA_Uebertemperatur	BOOL	FALSE	Status alarms: Malfunction overtemperature (M)
+30.1	SA_Fuehlerbruch	BOOL	FALSE	Status alarms: Malfunction sensor break (M)
+30.2	SA_Netz	BOOL	FALSE	Status alarms: Malfunction mains (M)
+30.3	SA_Andere	BOOL	FALSE	Status alamrs: Malfunction others
+30.4	SA_Bit_12_Reserve	BOOL	FALSE	Status alarms: Bit 12 Reserve
+30.5	SA_unzulaessiger_Wert	BOOL	FALSE	Status alarms: Illegal value (set or limit) (B)
+30.6	SA_unzulaessiger_Funkt	BOOL	FALSE	Status alarms: Illegal function (operating mode) (B)
+30.7	SA_Bit_15_Reserve	BOOL	FALSE	Status alarms: Bit 15 Reserve
+31.0	SA_obere_Abweichung	BOOL	FALSE	Status alarms: Upper deviation exceeded (P)
+31.1	SA_untere_Abweichung	BOOL	FALSE	Status alarms: Lower deviation exceeded (P)
+31.2	SA_Temp_Differenz	BOOL	FALSE	Status alarms: Temperature difference exceeded (P)
+31.3	SA_Durchfluss_ueberschr	BOOL	FALSE	Status alarms: Flow rate exceeded (P)
+31.4	SA_Durchfluss_unterschr	BOOL	FALSE	Status alarms: Flow rate not reached (P)
+31.5	SA_Prozessalarm_andere	BOOL	FALSE	Status alarms: Process alarm: others (P)
+31.6	SA_Bit_6_Reserve	BOOL	FALSE	Status alarms: Bit 6 Reserve
+31.7	SA_Fuellstand	BOOL	FALSE	Status alarms: Malfunction level (M)
+32.0	Temp_Diff_VL_RL_Ext1	INT	0	Zulässige TempDiff Vor/Rücklauf ext.1, Unit 0,1 K, Range 0-4000
+34.0	Temp_Diff_VL_RL_Ext2	INT	0	Zulässige TempDiff Vor/Rücklauf ext.2, Unit 0,1 K, Range 0-4000
+36.0	Temp_Diff_VL_RL_Ext3	INT	0	Zulässige TempDiff Vor/Rücklauf ext.3, Unit 0,1 K, Range 0-4000
+38.0	Temp_Diff_VL_RL_Ext4	INT	0	Zulässige TempDiff Vor/Rücklauf ext.4, Unit 0,1 K, Range 0-4000
+40.0	Temp_Diff_VL_RL_Ext5	INT	0	Zulässige TempDiff Vor/Rücklauf ext.5, Unit 0,1 K, Range 0-4000
+42.0	Temp_Diff_VL_RL_Ext6	INT	0	Zulässige TempDiff Vor/Rücklauf ext.6, Unit 0,1 K, Range 0-4000
+44.0	Temp_Diff_VL_RL_Ext7	INT	0	Zulässige TempDiff Vor/Rücklauf ext.7, Unit 0,1 K, Range 0-4000
+46.0	Temp_Diff_VL_RL_Ext8	INT	0	Zulässige TempDiff Vor/Rücklauf ext.8, Unit 0,1 K, Range 0-4000
+48.0	Durchfluss_minimum_Ext1	INT	0	Durchfluss minimum ext. 1, Unit 0,1 L/min, Range 0-4000
+50.0	Durchfluss_minimum_Ext2	INT	0	Durchfluss minimum ext. 2, Unit 0,1 L/min, Range 0-4000
+52.0	Durchfluss_minimum_Ext3	INT	0	Durchfluss minimum ext. 3, Unit 0,1 L/min, Range 0-4000
+54.0	Durchfluss_minimum_Ext4	INT	0	Durchfluss minimum ext. 4, Unit 0,1 L/min, Range 0-4000
+56.0	Durchfluss_minimum_Ext5	INT	0	Durchfluss minimum ext. 5, Unit 0,1 L/min, Range 0-4000
+58.0	Durchfluss_minimum_Ext6	INT	0	Durchfluss minimum ext. 6, Unit 0,1 L/min, Range 0-4000
+60.0	Durchfluss_minimum_Ext7	INT	0	Durchfluss minimum ext. 7, Unit 0,1 L/min, Range 0-4000
+62.0	Durchfluss_minimum_Ext8	INT	0	Durchfluss minimum ext. 8, Unit 0,1 L/min, Range 0-4000
+64.0	Durchfluss_maximum_Ext1	INT	0	Durchfluss maximum ext. 1, Unit 0,1 L/min, Range 0-4000
+66.0	Durchfluss_maximum_Ext2	INT	0	Durchfluss maximum ext. 2, Unit 0,1 L/min, Range 0-4000
+68.0	Durchfluss_maximum_Ext3	INT	0	Durchfluss maximum ext. 3, Unit 0,1 L/min, Range 0-4000
+70.0	Durchfluss_maximum_Ext4	INT	0	Durchfluss maximum ext. 4, Unit 0,1 L/min, Range 0-4000
+72.0	Durchfluss_maximum_Ext5	INT	0	Durchfluss maximum ext. 5, Unit 0,1 L/min, Range 0-4000
+74.0	Durchfluss_maximum_Ext6	INT	0	Durchfluss maximum ext. 6, Unit 0,1 L/min, Range 0-4000
+76.0	Durchfluss_maximum_Ext7	INT	0	Durchfluss maximum ext. 7, Unit 0,1 L/min, Range 0-4000
+78.0	Durchfluss_maximum_Ext8	INT	0	Durchfluss maximum ext. 8, Unit 0,1 L/min, Range 0-4000
+80.0	Istwert_Ruecklauf_Ext1	INT	0	Istwert Rücklauf ext. 1, Unit 0,1 °C, Range 0-4000
+82.0	Istwert_Ruecklauf_Ext2	INT	0	Istwert Rücklauf ext. 2, Unit 0,1 °C, Range 0-4000
+84.0	Istwert_Ruecklauf_Ext3	INT	0	Istwert Rücklauf ext. 3, Unit 0,1 °C, Range 0-4000
+86.0	Istwert_Ruecklauf_Ext4	INT	0	Istwert Rücklauf ext. 4, Unit 0,1 °C, Range 0-4000
+88.0	Istwert_Ruecklauf_Ext5	INT	0	Istwert Rücklauf ext. 5, Unit 0,1 °C, Range 0-4000
+90.0	Istwert_Ruecklauf_Ext6	INT	0	Istwert Rücklauf ext. 6, Unit 0,1 °C, Range 0-4000
+92.0	Istwert_Ruecklauf_Ext7	INT	0	Istwert Rücklauf ext. 7, Unit 0,1 °C, Range 0-4000
+94.0	Istwert_Ruecklauf_Ext8	INT	0	Istwert Rücklauf ext. 8, Unit 0,1 °C, Range 0-4000
+96.0	Durchfluss_Ext1	INT	0	Durchfluss ext. 1, Unit 0,1 L/min, Range 0-4000
+98.0	Durchfluss_Ext2	INT	0	Durchfluss ext. 2, Unit 0,1 L/min, Range 0-4000
+100.0	Durchfluss_Ext3	INT	0	Durchfluss ext. 3, Unit 0,1 L/min, Range 0-4000
+102.0	Durchfluss_Ext4	INT	0	Durchfluss ext. 4, Unit 0,1 L/min, Range 0-4000
+104.0	Durchfluss_Ext5	INT	0	Durchfluss ext. 5, Unit 0,1 L/min, Range 0-4000
+106.0	Durchfluss_Ext6	INT	0	Durchfluss ext. 6, Unit 0,1 L/min, Range 0-4000
+108.0	Durchfluss_Ext7	INT	0	Durchfluss ext. 7, Unit 0,1 L/min, Range 0-4000
+110.0	Durchfluss_Ext8	INT	0	Durchfluss ext. 8, Unit 0,1 L/min, Range 0-4000
=112.0		END_STRUCT		

Figure 7: Device DB11

3.6 Output to the temperature control unit

The output is triggered on the chip DB10. The data is written to the output ports.

```
Netzwerk 2 : Output to HB-THERM
Kommentar:

// Nominal value 1
      L     "DB10".Sollwert_1                DB10.DBW0          -- Nominal value 1, Unit 0,1°C, Range 0-4000
      T     PAW  256

// Nominal value 2
      L     "DB10".Sollwert_2                DB10.DBW2          -- Nominal value 2, Unit 0,1°C, Range 0-4000
      T     PAW  258

// Valid upper deviation nominal / actual value
      L     "DB10".Abweichung_oben           DB10.DBW4          -- Valid upper deviation nominal / actual value, Unit 0,1K, Range 0-4000
      T     PAW  260

// Valid lower deviation nominal / actual value
      L     "DB10".Abweichung_unten          DB10.DBW6          -- Valid lower deviation nominal / actual value, Unit 0,1K, Range 0-4000
      T     PAW  262

// Valid temperature difference main / return line
      L     "DB10".Temp_Diff_Vor_Ruecklauf   DB10.DBW8          -- Valid temperature difference main / return line, Unit 0,1K, Range 0-4000
      T     PAW  264

// Valid minimum flow rate
      L     "DB10".Durchfluss_minimum        DB10.DBW10         -- Valid minimum flow rate, Unit L/min, Range 0 - 1000
      T     PAW  266

// Valid maximum flow rate
      L     "DB10".Durchfluss_maximum        DB10.DBW12         -- Valid maximum flow rate, Unit L/min, Range 0 - 1000
      T     PAW  268

// Operating mode (Bit-Values)
      L     DB10.DBW   14
      T     PAW  270
//Actual value external sensor)
      L     "DB10".Istwert_Externfuehler     DB10.DBW16         -- Actual value external sensor
      T     PAW  272

// max. zulässige TempDiff Vor-Rück ext. 1-8
      L     "DB10".Temp_Diff_VL_RL_Ext1      DB10.DBW18         -- Zulässige Temp-Diff Vor/Rücklauf ext. 1, Unit 0,1 K, Range 0-4000
      T     PAW  274

      L     "DB10".Temp_Diff_VL_RL_Ext2      DB10.DBW20         -- Zulässige Temp-Diff Vor/Rücklauf ext. 2, Unit 0,1 K, Range 0-4000
      T     PAW  276

      L     "DB10".Temp_Diff_VL_RL_Ext3      DB10.DBW22         -- Zulässige Temp-Diff Vor/Rücklauf ext. 3, Unit 0,1 K, Range 0-4000
      T     PAW  278

      L     "DB10".Temp_Diff_VL_RL_Ext4      DB10.DBW24         -- Zulässige Temp-Diff Vor/Rücklauf ext. 4, Unit 0,1 K, Range 0-4000
      T     PAW  280

      L     "DB10".Temp_Diff_VL_RL_Ext5      DB10.DBW26         -- Zulässige Temp-Diff Vor/Rücklauf ext. 5, Unit 0,1 K, Range 0-4000
      T     PAW  282

      L     "DB10".Temp_Diff_VL_RL_Ext6      DB10.DBW28         -- Zulässige Temp-Diff Vor/Rücklauf ext. 6, Unit 0,1 K, Range 0-4000
      T     PAW  284

      L     "DB10".Temp_Diff_VL_RL_Ext7      DB10.DBW30         -- Zulässige Temp-Diff Vor/Rücklauf ext. 7, Unit 0,1 K, Range 0-4000
      T     PAW  286

      L     "DB10".Temp_Diff_VL_RL_Ext8      DB10.DBW32         -- Zulässige Temp-Diff Vor/Rücklauf ext. 8, Unit 0,1 K, Range 0-4000
      T     PAW  288
// zulässiger Durchfluss min ext. 1-8
      L     "DB10".Durchfluss_minimum_Ext1   DB10.DBW34         -- Durchfluss minimum ext. 1, Unit 0,1 L/min, Range 0-4000
      T     PAW  290

      L     "DB10".Durchfluss_minimum_Ext2   DB10.DBW36         -- Durchfluss minimum ext. 2, Unit 0,1 L/min, Range 0-4000
      T     PAW  292

      L     "DB10".Durchfluss_minimum_Ext3   DB10.DBW38         -- Durchfluss minimum ext. 3, Unit 0,1 L/min, Range 0-4000
      T     PAW  294

      L     "DB10".Durchfluss_minimum_Ext4   DB10.DBW40         -- Durchfluss minimum ext. 4, Unit 0,1 L/min, Range 0-4000
      T     PAW  296

      L     "DB10".Durchfluss_minimum_Ext5   DB10.DBW42         -- Durchfluss minimum ext. 5, Unit 0,1 L/min, Range 0-4000
      T     PAW  298

      L     "DB10".Durchfluss_minimum_Ext6   DB10.DBW44         -- Durchfluss minimum ext. 6, Unit 0,1 L/min, Range 0-4000
      T     PAW  300

      L     "DB10".Durchfluss_minimum_Ext7   DB10.DBW46         -- Durchfluss minimum ext. 7, Unit 0,1 L/min, Range 0-4000
      T     PAW  302

      L     "DB10".Durchfluss_minimum_Ext8   DB10.DBW48         -- Durchfluss minimum ext. 8, Unit 0,1 L/min, Range 0-4000
      T     PAW  304

// zulässiger Durchfluss max ext. 1-8
      L     "DB10".Durchfluss_maximum_Ext1   DB10.DBW50         -- Durchfluss maximum ext. 1, Unit 0,1 L/min, Range 0-4000
      T     PAW  306

      L     "DB10".Durchfluss_maximum_Ext2   DB10.DBW52         -- Durchfluss maximum ext. 2, Unit 0,1 L/min, Range 0-4000
      T     PAW  308

      L     "DB10".Durchfluss_maximum_Ext3   DB10.DBW54         -- Durchfluss maximum ext. 3, Unit 0,1 L/min, Range 0-4000
      T     PAW  310

      L     "DB10".Durchfluss_maximum_Ext4   DB10.DBW56         -- Durchfluss maximum ext. 4, Unit 0,1 L/min, Range 0-4000
      T     PAW  312

      L     "DB10".Durchfluss_maximum_Ext5   DB10.DBW58         -- Durchfluss maximum ext. 5, Unit 0,1 L/min, Range 0-4000
      T     PAW  314

      L     "DB10".Durchfluss_maximum_Ext6   DB10.DBW60         -- Durchfluss maximum ext. 6, Unit 0,1 L/min, Range 0-4000
      T     PAW  316

      L     "DB10".Durchfluss_maximum_Ext7   DB10.DBW62         -- Durchfluss maximum ext. 7, Unit 0,1 L/min, Range 0-4000
      T     PAW  318

      L     "DB10".Durchfluss_maximum_Ext8   DB10.DBW64         -- Durchfluss maximum ext. 8, Unit 0,1 L/min, Range 0-4000
      T     PAW  320
            DB10.DBW60 / "DB10".Durchfluss_maximum_Ext6 / Durchfluss maximum ext. 6, Unit 0,1 L/min, Range 0-4000
```

Figure 8: Output to the temperature control unit

3.6.1 Device DB10

Address space for controlling the device.

Adresse	Name	Typ	Anfangswert	Kommentar
0.0		STRUCT		
+0.0	Sollwert_1	INT	567	Nominal value 1, Unit 0,1°C, Range 0-4000
+2.0	Sollwert_2	INT	345	Nominal value 2, Unit 0,1°C, Range 0-4000
+4.0	Abweichung_oben	INT	24	Valid upper deviation nominal / actual value, Unit 0,1K, Range 0-4000
+6.0	Abweichung_unten	INT	12	Valid lower deviation nominal / actual value, Unit 0,1K, Range 0-4000
+8.0	Temp_Diff_Vor_Ruecklauf	INT	67	Valid temperature difference main / return line, Unit 0,1K, Range 0-4000
+10.0	Durchfluss_minimum	INT	1	Valid minimum flow rate, Unit L/min, Range 0 - 1000
+12.0	Durchfluss_maximum	INT	50	Valid maximum flow rate, Unit L/min, Range 0 - 1000
+14.0	BA_Alarm_Reset	BOOL	FALSE	Operating mode: Alarm reset (for acknowledging P- / M-alarms)
+14.1	BA_Bit_9_Reserve	BOOL	FALSE	Operating mode: Bit 9 Reserve
+14.2	BA_Bit_10_Reserve	BOOL	FALSE	Operating mode: Bit 10 Reserve
+14.3	BA_Bit_11_Reserve	BOOL	FALSE	Operating mode: Bit 11 Reserve
+14.4	BA_Bit_12_Reserve	BOOL	FALSE	Operating mode: Bit 12 Reserve
+14.5	BA_Bit_13_Reserve	BOOL	FALSE	Operating mode: Bit 13 Reserve
+14.6	BA_Bit_14_Reserve	BOOL	FALSE	Operating mode: Bit 14 Reserve
+14.7	BA_Watchdog	BOOL	TRUE	Operating mode: Watchdog
+15.0	BA_Geraet_Ein_Aus	BOOL	TRUE	Operating mode: Unit ON/OFF
+15.1	BA_Abkuehlen_Ein_Aus	BOOL	FALSE	Operating mode: Cooling ON/OFF
+15.2	BA_Formentleerung_Ein_A	BOOL	FALSE	Operating mode: Mould evacuation ON/OFF
+15.3	BA_Leckstopbetrieb_Ein_A	BOOL	FALSE	Operating mode: Leak stopper ON/OFF
+15.4	BA_Externfuehler_Ein_Aus	BOOL	FALSE	Operating mode: External sensor ON/OFF
+15.5	BA_2_Sollwert_Ein_Aus	BOOL	FALSE	Operating mode: 2nd nominal value ON/OFF
+15.6	BA_Bit_6_Reserve	BOOL	FALSE	Operating mode: Bit 6 Reserve
+15.7	BA_Bit_7_Reserve	BOOL	FALSE	Operating mode: Bit 7 Reserve
+16.0	Istwert_Externfuehler	INT	0	Actual value external sensor
+18.0	Temp_Diff_VL_RL_Ext1	INT	0	Zulässige Temp-Diff Vor/Rücklauf ext. 1, Unit 0,1 K, Range 0-4000
+20.0	Temp_Diff_VL_RL_Ext2	INT	0	Zulässige Temp-Diff Vor/Rücklauf ext. 2, Unit 0,1 K, Range 0-4000
+22.0	Temp_Diff_VL_RL_Ext3	INT	0	Zulässige Temp-Diff Vor/Rücklauf ext. 3, Unit 0,1 K, Range 0-4000
+24.0	Temp_Diff_VL_RL_Ext4	INT	0	Zulässige Temp-Diff Vor/Rücklauf ext. 4, Unit 0,1 K, Range 0-4000
+26.0	Temp_Diff_VL_RL_Ext5	INT	0	Zulässige Temp-Diff Vor/Rücklauf ext. 5, Unit 0,1 K, Range 0-4000
+28.0	Temp_Diff_VL_RL_Ext6	INT	0	Zulässige Temp-Diff Vor/Rücklauf ext. 6, Unit 0,1 K, Range 0-4000
+30.0	Temp_Diff_VL_RL_Ext7	INT	0	Zulässige Temp-Diff Vor/Rücklauf ext. 7, Unit 0,1 K, Range 0-4000
+32.0	Temp_Diff_VL_RL_Ext8	INT	0	Zulässige Temp-Diff Vor/Rücklauf ext. 8, Unit 0,1 K, Range 0-4000
+34.0	Durchfluss_minimum_Ext1	INT	0	Durchfluss minimum ext. 1, Unit 0,1 L/min, Range 0-4000
+36.0	Durchfluss_minimum_Ext2	INT	0	Durchfluss minimum ext. 2, Unit 0,1 L/min, Range 0-4000
+38.0	Durchfluss_minimum_Ext3	INT	0	Durchfluss minimum ext. 3, Unit 0,1 L/min, Range 0-4000
+40.0	Durchfluss_minimum_Ext4	INT	0	Durchfluss minimum ext. 4, Unit 0,1 L/min, Range 0-4000
+42.0	Durchfluss_minimum_Ext5	INT	0	Durchfluss minimum ext. 5, Unit 0,1 L/min, Range 0-4000
+44.0	Durchfluss_minimum_Ext6	INT	0	Durchfluss minimum ext. 6, Unit 0,1 L/min, Range 0-4000
+46.0	Durchfluss_minimum_Ext7	INT	0	Durchfluss minimum ext. 7, Unit 0,1 L/min, Range 0-4000
+48.0	Durchfluss_minimum_Ext8	INT	0	Durchfluss minimum ext. 8, Unit 0,1 L/min, Range 0-4000
+50.0	Durchfluss_maximum_Ext1	INT	0	Durchfluss maximum ext. 1, Unit 0,1 L/min, Range 0-4000
+52.0	Durchfluss_maximum_Ext2	INT	0	Durchfluss maximum ext. 2, Unit 0,1 L/min, Range 0-4000
+54.0	Durchfluss_maximum_Ext3	INT	0	Durchfluss maximum ext. 3, Unit 0,1 L/min, Range 0-4000
+56.0	Durchfluss_maximum_Ext4	INT	0	Durchfluss maximum ext. 4, Unit 0,1 L/min, Range 0-4000
+58.0	Durchfluss_maximum_Ext5	INT	0	Durchfluss maximum ext. 5, Unit 0,1 L/min, Range 0-4000
+60.0	Durchfluss_maximum_Ext6	INT	0	Durchfluss maximum ext. 6, Unit 0,1 L/min, Range 0-4000
+62.0	Durchfluss_maximum_Ext7	INT	0	Durchfluss maximum ext. 7, Unit 0,1 L/min, Range 0-4000
+64.0	Durchfluss_maximum_Ext8	INT	0	Durchfluss maximum ext. 8, Unit 0,1 L/min, Range 0-4000
=66.0		END_STRUCT		

Figure 9: Device DB10

3.7 Panel

A STEP 7 project includes a panel for simulation. It is run with the software WinCC-flexible-Runtime 2008.

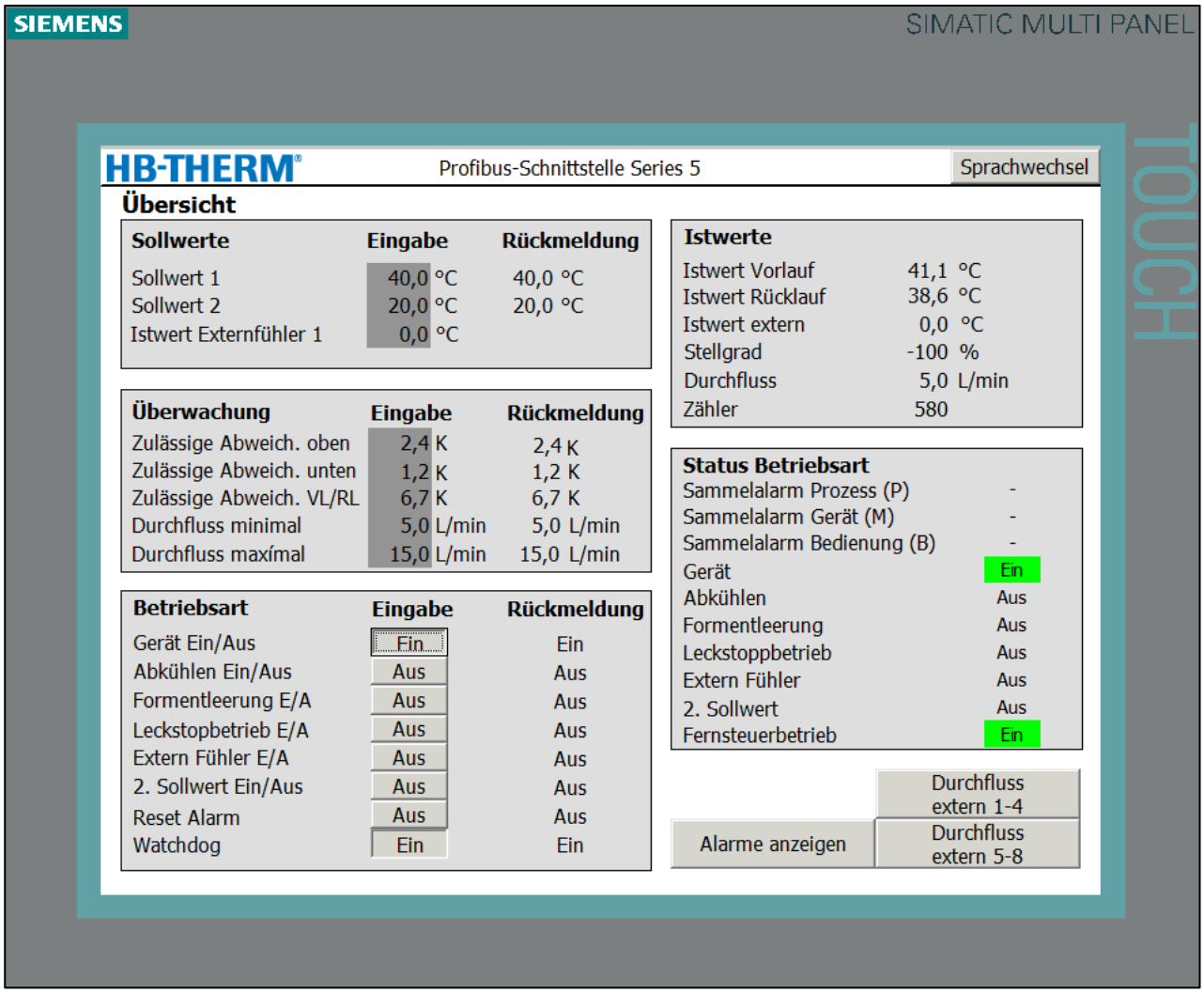

Figure 10: Example single device

3.8 Settings of the Thermo-5 temperature control unit

The Thermo-5 temperature control unit requires the following settings:

Menu Setting \ Remote

- Set parameter Protocol to "15" (Profibus-DP)
- Set parameter Address to the desired value (in this case "1")
- Set parameter Compatibility Profibus to S4 to "no"
- Set parameter Profibus node 1 to the desired value (in this case "5")

Menu Functions

- Select and activate the Remote control mode function

Further details are provided in the instruction manual of the temperature control unit.