The 2704 is a highly accurate and stable process controller available in a single, dual or triple loop format. Features include setpoint programming and a comprehensive selection of maths and logic functions.

Its user interface incorporates a bright dot matrix display, providing extreme flexibility and ease of use. It is a highly configurable product offering many features previously found only in programmable logic controllers. This allows systems to be implemented integrating the process control and logic functions of a machine, therefore simplifying system complexity and reducing the total system costs.

Configuration is achieved either via the front panel interface or using Eurotherm’s iTools configuration software.
Control Functions

- 3 Control loops
- PID, VP or ON/OFF
- Cascade, ratio or override
- Gain scheduling
- Configurable control strategies

Eurotherm’s advanced control algorithm gives stable straight-line control. Automatic tuning simplifies the commissioning procedure by performing a one shot tune to calculate the optimum PID values. To further optimise control especially in programmer applications, gain scheduling can be used to transfer control between up to six sets of PID values.

Trending enables the user to view, both current and historical information on the process variable and setpoint of each control loop.

IO Hardware

- 0.25uV PV input resolution
- Fixed and modular IO
- 250Vac isolation
- Expandable IO
- Easily upgraded

The 2704 incorporates a self correcting input circuit (INSTANT ACCURACY) to maximise accuracy and performance during initial warm up and changes in ambient temperature.

One universal and one high level analogue inputs, along with 10 digital IO are included as standard. Additionally, a further 5 IO modules may be fitted providing very flexible input/output combinations. The series 2000IO expander unit can provide an additional 20 digital inputs and 20 digital outputs.

Setpoint Programmer

- 60 Programs,
- 3 Profiled setpoints/program
- 650 Segments
- 16 Event outputs
- Program mimic display

Ideal for applications such as atmosphere or vacuum furnaces, and environmental chambers. The 2704 user interface offers the user an extremely easy method of editing, selecting and running programs.

- Offline or online editing on PC
- Graphical representation
- Advanced editing functions
- Storage and retrieval of program files
• Mathematical calculations
• Combinational logic
• Real time clock
• Timer functions

Operators include:
Add, Subtract, Log, Exp, SQRT, AND, OR, Max, Min, Select and many more

ToolKit blocks allows the user to create custom solutions by internally wiring analogue and digital operations together in flexible ways. 24 analogue and 32 digital operations are available. Other functions are available including timers, totalisers and a real time clock.

I/O Expander

• 20 Logic inputs
• 20 Relay outputs

The 2000IO expander can increase the digital IO providing the option for greater remote operation of the programmer and expands the 2704 logic capability.

Slave Communications

• Modbus™ RTU
• Profibus® DP
• Ethernet Modbus/TCP
• DeviceNet®
• EI-Bisync

The 2704 supports two slave communication ports. Its modular build provides the user with a selection of communication protocols allowing easy integration into both PLC and PC supervisory systems.

When using Profibus DP a GSD file has to be created, containing the information relating to the instruments parameters, that a Profibus master needs in order to communicate with its slave device. The GSD file for a 2704 is created using Eurotherm’s GSD file editor.

Master Communications

• Modbus Protocol
• 100 read/write parameters
• Expands available hardware
• Interfaces to most Modbus slaves

Master modbus communications significantly increases the applications open to 2704. In its simplest form it can be used to retransmit a setpoint to a number of slave controllers in a multi-zone furnace. Alternatively, it can be integrated with an 8 loop blind controller to provide a remote operator interface with SP programmer functions.
• Direct interface to vacuum gauges
• Auto Hi/Lo gauge selection
• 6 Vacuum setpoints
• Pump timeout alarm
• Leak detection routine

At the heart of the vacuum controller is a specially designed function block capable of accepting up to three vacuum inputs. The 2704 is capable of being used solely to control the vacuum pump down sequence of a furnace, or as an integral furnace controller where both temperature and vacuum are controlled.

Carbon potential
• %CP, O₂ or Dewpoint Measurement
• CO correction
• Probe burn off and sooting alarm
• Sooting alarm

Ideal for use in gas carburising furnaces where Zirconia probes are used to measure Carbon Potential. A three loop controller can be used to control furnace temperature, carbon potential and quench. The setpoint programmer is used in batch applications to generate synchronised temperature and carbon profiles.

Melt Pressure
• 350Ω Strain gauge input
• Transducer excitation
• Pressure alarms
• Screen blockage alarm
• Simple user calibration with shunt

Suitable for precision pressure control in the plastic extrusion industries. Additionally a second pressure transducer can be used to provide a differential pressure alarm when the screen starts to block. Various machine start up strategies can be used to ensure a smooth transition from auto to manual mode.

Customisable Display

By using flexible User Pages, the user has the option of defining how the process screens are viewed. A maximum of eight user pages can be configured.
Technical specification

Control options
No. of loops 1, 2 or 3 loops
Options Cascade, Ratio or Override
Modes PID, ON/OFF or Valve Position
Applications Carbon Potential, Humidity and Vacuum

STANDARD I/O
Precision PV input
Accuracy ±0.1%
Ranges mV, mA, volts or RTD (PT100)
Cold junction Ext 0°C, 45°C or 50°C

Analogue input
Allocation 1 fitted
Accuracy ±0.1%
Ranges -10V to 10V or 0 to 20mA

Digital I/O
Types 1 digital input
7 Bi-directional input/outputs
1 Changeover relay

MODULES
Digital outputs
Types Single relay, dual relay, Single Triac, Dual Triac, Single Logic and Triple Logic module
Allocation Slot 1, 3, 4, 5 or 6 (Max 3 Triacs per unit)

Digital inputs
Types Triple contact input, Triple logic input
Allocation Slot 1, 3, 4, 5 or 6

Analogue outputs
Types DC Control or DC Retransmission (5 Max)
Allocation Slot 1, 3, 4, 5 or 6
Range 0 to 20mA or 0 to 10Vdc

Dual Analogue outputs
Allocation Slot 1, 4 or 5
Range 4-20mA or 24Vdc transmitter PSU

High Resolution Analogue output
Allocation Slot 1, 4 or 5
Range 4-20mA and 24Vdc transmitter PSU

Transmitter PSU
Allocation Slot 1, 3, 4, 5 or 6
Transmitter 24Vdc @ 20mA

Transducer supply
Bridge voltage Software selectable, 5 or 10Vdc
Bridge resistance 300Ω to 15Kohms

Potentiometer input
Potentiometer resistance 330Ω to 150Kohms

Precision PV input (Module)
Allocation Slot 3 or 6
Accuracy ±0.1%
Ranges mV, mA, volts or RTD (PT100)
Cold junction Ext 0°C, 45°C or 50°C

4 wire PRT (Modules)
Allocation Slot 3 or 6
Accuracy <0.005%
Types PRT 100, PRT 25.5
Range -200 to +850°C

Dual (Probe) input
Allocation Slot 3 or 6
Accuracy ±0.1%
Ranges mV, mA, volts or RTD (PT100)
Cold junction Ext 0°C, 45°C or 50°C

Analogue input (module)
Allocation Slot 1, 3, 4 or 6
Accuracy ±0.1%
Ranges mV, mA, volts or RTD (PT100)
Cold junction Ext 0°C, 45°C or 50°C

SETPOINT PROGRAMMER
No profiles 1, 2 or 3 profiles
No. of programs 50 programs max.
No. of segments 650 time to target segments (Max) or 400 ramp rate segments (Max.)
Event outputs Up to 16

I/O Expander
10 I/O Version 4 Changeover and 6 normally open relay contacts
10 Logic inputs
20 I/O Version 4 Changeover and 16 normally open contacts
20 Logic inputs

ADVANCED FUNCTIONS
Application blocks 32 digital operations
32 analogue operations
50 user values
Timers 4 ON pulse, OFF delay, one shot and min-ON
Totalisers 4, trigger level and reset input
Pattern generators 16 patterns each with 16 bits
Real time clock Day of week and time
Customisable screens 8 user screens
User switches 8, toggle and momentary function

Slave communications
Allocation Slot H or J
(Ethernet, DeviceNet/Profibus slot H only)
Types Profibus DP RS485
Ethernet Modbus/TCP
Modbus RTU RS485 (2 wire), RS485 (4 wire) or RS232
DeviceNet
EI-Bisyc (subset of parameters)

Master communications
Allocation Slot J
Types Modbus RTU RS485 (2 wire), RS485 (4 wire) or RS232
Parameters 100 read/write

GENERAL SPECIFICATION
Display range 5 digits up to 4 decimal places
85 to 264Vac, 20 watts (max.) or 24Vdc or ac, 10 watts (max)
Operating ambient 0 to 50°C and 5 to 95%RH non condensing
Storage temperature -10 to 70°C
Panel seal IP65
EMC standards EN61326-1 Suitable for domestic, commercial and light industrial as well as heavy industrial environments. (Domestic/light industrial (Class B) emissions, Industrial (Class A) Environment immunity emissions). With Ethernet module fitted product is only suitable for industrial environments, (Class A emissions)
Safety standards Meets EN61010 installation category II, pollution degree 2
Atmospheres Not suitable for use above 2000m or in explosive or corrosive atmospheres

ed at 0 to 50°C unless otherwise stated.
Refer to Engineering Manual for more details.
It is only necessary to order the hardware required. Completion of the quick start code opposite will assist you in configuring the 2704.

If you require Eurotherm to supply a fully configured product, you can use the iTools configuration software to generate a clone file which will be downloaded into the 2704 prior to shipment. Eurotherm will then assign a specific number to your instrument allowing you to easily re-order the same configuration. If you have not previously purchased iTools, please contact your local Eurotherm sales office.

**Example ordering code**

```
2704 - VH - 323 - XX - RR - PV - D4 - TP - PV - A2 - XX - ENG - U1 - IT
```

This code describes a 3 loop controller with capability to store 20 three profile programs. Supply voltage is 85-264Vac. Modular hardware: 2 x PV input, 1 x Dual relay, 1 x DC control, 1 x Triple logic output, EIA-232 Comms. 16 analogue and 16 digital operations, iTools supplied with controller.

### Controller Type
- **2704**: Standard
- **2704f**: Profibus

### Supply Voltage
- **VH**: 85-264Vac
- **VL**: 20-29Vac/dc

### Loop/Programs
- **First digit**
  - 1: One loop
  - 2: Two loops
  - 3: Three loops
- **Second digit**
  - 0: No programs
  - 2: Twenty programs
  - 5: Sixty programs
- **Third digit**
  - 0: No programs
  - 1: 1 Profile
  - 2: 2 Profile
  - 3: 3 Profile

### I/O slots 1,3,4,5,6
- **First digit**: None fitted
- **2**: Change over relay
- **3**: 2 Pin relay
- **4**: Digital relay
- **5**: Dual relay
- **6**: Analogue input (not slot 3)
- **7**: Double relay
- **8**: Digital output (not slot 3)
- **9**: Analog input (not slot 3)
- **10**: Digital output (not slot 3)
- **11**: Analog input (not slot 3)
- **12**: Digital output (not slot 3)
- **13**: Analog input (not slot 3)
- **14**: Digital output (not slot 3)
- **15**: Analog input (not slot 3)
- **16**: Digital output (not slot 3)

### Comms H
- **X**: None fitted
- **A**: 232 Modbus
- **Y**: 2-wire 485 Modbus
- **F**: 4-wire 485 Modbus
- **P**: Profibus
- **D**: DeviceNet
- **T**: Modbus/TCP Ethernet

### Manual
- **ENG**: English
- **FRA**: French
- **GER**: German
- **ITA**: Italian
- **NED**: Dutch
- **SPA**: Spanish
- **SWE**: Swedish

### Toolkit Functions
- **XX**: Standard (2)
- **U1**: Toolkit level 1 (3)
- **U2**: Toolkit level 2 (3)

### Hardware notes:
1. Basic Controller/Programmer includes 8 digital registers, 10 user values, 4 timers and 4 totalisers and a real time clock.
2. Toolkit 1 includes 16 analogue, 16 digital, 1 multiple input block pattern generator, digital programmer, analogue switch, wiring block and 30 user values.
3. Toolkit 2 includes Toolkit 1 plus extra 16 analogue,16 digital, 2 multiple input blocks and 20 user values.
4. Dual analogue input suitable for one low level and one high level input (inputs not isolated from each other).
5. Each channel of the DO module can be 4-20mA control output or a 24Vdc power supply.
6. The HR module has 1 high resolution DC output and 1 24Vdc power supply. HR module should be used in feedback mode, refer to TIBC 167.
7. Boiler function includes bottom blowdown.
8. TDS can be temperature compensated.
Loop 3: PID control, 4-20mA input in slot 6, Logic heat/cool output in slot 5.

Loop 2: PID control, RTD input in slot 3, 0-10Vdc Heat output in slot 4.

4-20mA remote setpoint input

This code configures the hardware specified above:

Loop 1
- Type: PID control
- Input: [Slot 3]
- Output: [Slot 5]

Loop 2
- Type: PID control
- Input: [Slot 3]
- Output: [Slot 4]

Loop 3
- Type: PID control
- Input: [Slot 6]
- Output: [Slot 5]

Quick start order code


This code configures the hardware specified above:

Loop 1: Valve position control, Type K input, Heat VP output in slot 1, 4-20mA remote setpoint input

Loop 2: PID control, RTD input in slot 3, 0-10Vdc Heat output in slot 4

Loop 3: PID control, 4-20mA input in slot 6, Logic heat/cool output in slot 5

General notes:
1. Loop 1 PV defaults to main PV input on microboard. Loop 2 and 3 PV inputs must be fitted in I/O slots 3 or 6 or be assigned to the analogue input.
2. Alarm configuration refers to loop alarms only. One selection is allowed per loop. Additional alarms are available for the user to configure.
3. Thermocouple and RTD inputs assume sensor min and max values with no decimal point.
4. Linear inputs are ranged 0-100%, no decimal point.
5. Temperature units will be °C unless ordered by USA where °F will be used.
6. Remote setpoints assume loop min & max ranges.
7. VP1, VP2, VP3 and VP4 are not available with over ride function.
8. For Cascade and Override inputs only.
9. HR module should be used in feedback mode, please refer to TIBC160.
All dimensions in mm

Panel cut-out

92 x 92

-0.0

+0.8

Rear terminal connections

Common

Digital I/O

PV Input

Line

65 to 264Vac

Neutral

Earth

Digital Input

I/O Expander

or Digital Input

Relay

Analogue input –10V

Analogue input screen

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Part No. HA026916 Issue 6 2704 Data sheet

Printed in England 09.04