12.6 AT664

12.6.1 Technical Data

Module ID	AT664
General Information	
Model Number	7AT664.70
Short Description	2003 Analog Input Module, 4 inputs, thermocouples, -270 to +1372 °C, screw-in module, Order TB712 terminal block separately!
C-UL-US Listed	Yes
B&R ID Code	$0C
Slot	AF101 adapter module, CP interface
Static Characteristics	
Module Type	B&R 2003 screw-in module
Number of Inputs	4
Sensor	Thermocouples
Digital Converter Resolution	16 Bit
Measurement Range 　Sensor Temperature 　　FeCuNi: Type J 　　NiCrNi: Type K 　　PtRhPt: Type S 　Terminal Temperature 　Raw Value	Depending on sensor type [1] -210 to +1200 °C -270 to +1372 °C -50 to +1768 °C -55 to +125 °C $\pm 65534\,\mu V$
Resolution 　Sensor Temperature Output 　Sensor Temperature Output 　Raw Value Output	 0.1 °C / LSB 0.1 °C / LSB $2\,\mu V$ / LSB
Terminal Temperature Compensation	Yes [1]
Maximum Error at 25 °C	$\pm (50\,\mu V + 0.001 * U_{TH})\ [\mu V]$ U_{TH} ... Thermal Voltage in μV
Maximum Temperature Drift per °C	$\pm (1.7\,\mu V + 0.0001 * U_{TH})\ [\mu V]$ U_{TH} ... Thermal Voltage in μV
Terminal Temperature Error	± 1 °C after 10 min

Module ID	AT664
Conversion of Measurement Values to Temperature Values	Automatic in the module
Power Consumption	Max. 0.4 W
Operating Characteristics	

Electrical Isolation
  Input - PCC
  Input - Input
	No
	No

Mechanical Properties	
Dimensions	B&R 2003 screw-in module

[1] Can be configured using software.

12.6.2 General Information

The AT664 is a 4-channel temperature module. The module is activated by selecting a sensor type in configuration word 14. The selected sensor type is used for all channels.

12.6.3 Operating Modes

| Type of operation	Description
Sensor type: J, K, S	Temperature range - see "Technical Data" with terminal temperature compensation
Raw value	Voltage range ±65.534 mV quantized to 2 µV without terminal temperature compensation

12.6.4 Special Functions

- The terminal temperature can be entered for each channel for terminal temperature compensation.
- Unnecessary channels can be switched off, thereby reducing the refresh time. The time saving per channel depends on the hardware filter time:

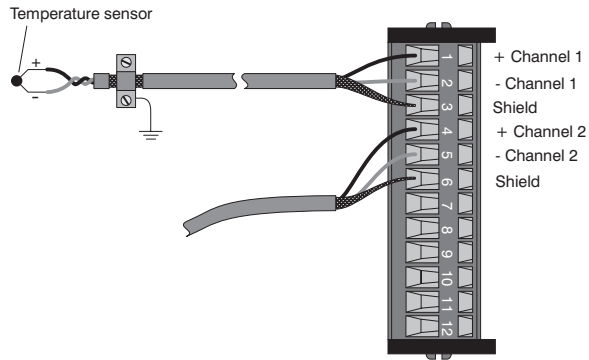| Hardware filter time	Saving per channel
50 Hz	60 ms
60 Hz	50 ms

12.6.5 Input Circuit Diagram
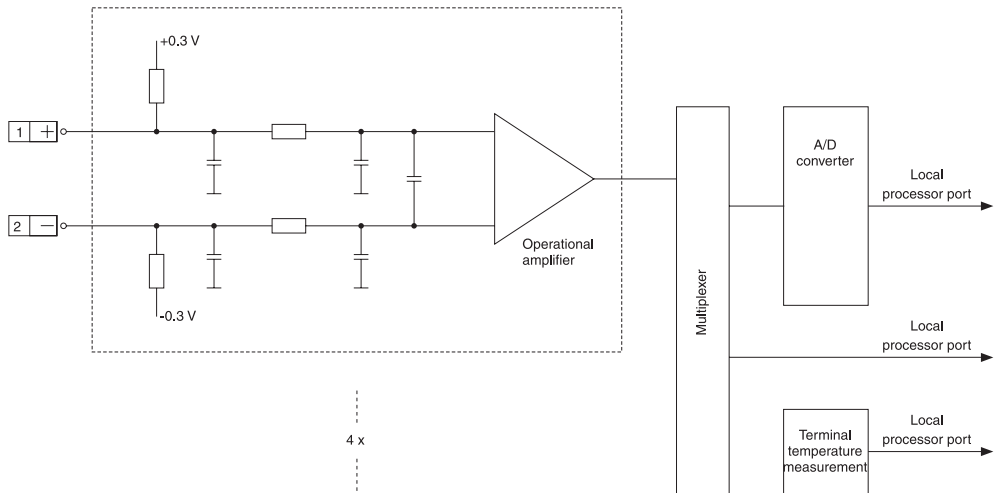
12.6.6 Connections
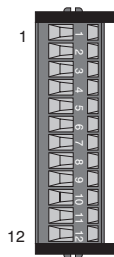
TB712

Pin	Assignment
1	+ channel 1
2	- channel 1
3	Shield
4	+ channel 2
5	- channel 2
6	Shield
7	+ channel 3
8	- channel 3
9	Shield
10	+ channel 4
11	- channel 4
12	Shield

12.6.7 Connection Example

Temperature sensor

+ Channel 1
- Channel 1
Shield
+ Channel 2
- Channel 2
Shield

12.6.8 Variable Declaration

The variable declaration is valid for the following controllers:

- 2003 PCC CPU
- Remote I/O Bus Controller
- CAN Bus Controller

The variable declaration is made in PG2000. The variable declaration is described in Chapter 4, "Module Addressing".

Automation Studio™ Support: See Automation Studio™ Help starting with V 1.40

Accessing screw-in modules is also explained in the sections "AF101" and "CPU".

Data access takes place using data and configuration words. The following table provides an overview of which data and configuration words are used for this module.

Data Access	VD Data Type	VD Module Type	VD Chan.	R	W	Description
Data word 0	INT16	Analog In	1	●		Temperature channel 1
Data word 1	INT16	Analog In	2	●		Temperature channel 2
Data word 2	INT16	Analog In	3	●		Temperature channel 3
Data word 3	INT16	Analog In	4	●		Temperature channel 4
Configuration word 8	INT16	Transp. In	16	●		Terminal temp. of channel 1 for external conversion
	INT16	Transp. Out	16		●	Terminal temp. of channel 1 for external ref. junction
Configuration word 9	INT16	Transp. In	18	●		Terminal temp. of channel 2 for external conversion
	INT16	Transp. Out	18		●	Terminal temp. of channel 2 for external ref. junction
Configuration word 10	INT16	Transp. In	20	●		Terminal temp. of channel 3 for external conversion
	INT16	Transp. Out	20		●	Terminal temp. of channel 3 for external ref. junction
Configuration word 11	INT16	Transp. In	22	●		Terminal temp. of channel 4 for external conversion
	INT16	Transp. Out	22		●	Terminal temp. of channel 4 for external ref. junction
Configuration word 12	WORD	Transp. In	24	●		Module status
Configuration word 14	WORD	Transp. In	28	●		Module type
	WORD	Transp. Out	28		●	Module configuration

12.6.9 Access Using CAN IDs

Access via CAN Identifiers is used if the slave is being controlled by a device from another manufacturer.
Access via CAN Identifiers is described in an example in Chapter 4, "Module Addressing".
The transfer modes are explained in Chapter 5, "CAN Bus Controller Functions".

Data cannot be packed on the AT664. Therefore one CAN object is transferred per screw-in module.
If an adapter module AF101 is equipped with a four AT664 modules, the CAN object has the following structure:

Slot	CAN ID [1]	Word 1		Word 2		Word 3		Word 4	
1	542	Chan. 1L	Chan. 1H	Chan. 2L	Chan. 2H	Chan. 3L	Chan. 3H	Chan. 4L	Chan. 4H
2	543	Chan. 1L	Chan. 1H	Chan. 2L	Chan. 2H	Chan. 3L	Chan. 3H	Chan. 4L	Chan. 4H
3	544	Chan. 1L	Chan. 1H	Chan. 2L	Chan. 2H	Chan. 3L	Chan. 3H	Chan. 4L	Chan. 4H
4	545	Chan. 1L	Chan. 1H	Chan. 2L	Chan. 2H	Chan. 3L	Chan. 3H	Chan. 4L	Chan. 4H

[1] CAN ID = 542 + (nd - 1) x 16 + (ma - 1) x 4 + (sl - 1)

nd ..... Node number of the CAN slave = 1

ma .... Module address of the AF101 = 1

sl .... Slot number of the screw-in module on the AF101 (1 - 4)

> ⚠ **B&R 2000 users have to exchange the data so that the high data is first (Motorola format)!**

For more information on ID allocation, see Chapter 5, "CAN Bus Controller Functions".

12.6.10 Description of Data and Configuration Words

Data word 0, 1, 2, 3 (read)

The temperature value or a 16 bit standardized raw value is read depending on the sensor type selected.

Configuration Word 8, 9, 10, 11 (read)

Reads the terminal temperature to externally calculate the temperature from the the raw value.

Configuration Word 8, 9, 10, 11 (write)

The terminal temperature can be set for installation of a reference junction. Operation together with a reference junction is only possible for **all** four channels.
Switching occurs as soon as **one** of the configuration words 8 - 11 is written to.
Switching back occurs by writing $80xx to **one** of the configuration words 8 - 11.

Configuration Word 12 (read)

Configuration word 12 contains the module status.

	Bit	Description
	12 - 15	x.... Not defined, masked out
	11	0.... Converter value 1 ready 1.... Converter value 1 not yet ready
	10	0.... Converter value 2 ready 1.... Converter value 2 not yet ready
	9	0.... Converter value 3 ready 1.... Converter value 3 not yet ready
	8	0.... Converter value 4 ready 1.... Converter value 4 not yet ready
	3 - 7	x.... Not defined, masked out
	0 - 2	Channel currently being converted 1.... Channel 1 2.... Channel 2 3.... Channel 3 4.... Channel 4

x	x	x	x					x	x	x	x	x			
15								8	7						0

Configuration Word 14 (read)

The High Byte of configuration word 14 defines the module code.

	Bit	Description
	8 - 15	Module code = $0C
	0 - 7	x....Not defined, masked out

0	0	0	0	1	1	0	0	x	x	x	x	x	x	x	x

15   8 7   0

Configuration Word 14 (write)

The module is configured using configuration word 14.

	Bit	Description
	14 - 15	0
	12 - 13	Select the hardware filter time 0....50 Hz (default) 1....60 Hz
	11	0....Channel 4 is switched on (default) 1....Channel 4 is switched off
	10	0....Channel 3 is switched on (default) 1....Channel 3 is switched off
	9	0....Channel 2 is switched on (default) 1....Channel 2 is switched off
	8	0....Channel 1 is switched on (default) 1....Channel 1 is switched off
	3 - 7	0
	0 - 2	Selection of the sensor type or the value to be given for all four channels. 0....No conversion (default) 1....Sensor type J 2....Sensor type K 3....Sensor type S 7....Raw value without linearization and terminal temperature compensation (Quantization 2 µV with a theoretical measurement range of ±65 mV)

0	0							0	0	0	0	0			

15   8 7   0