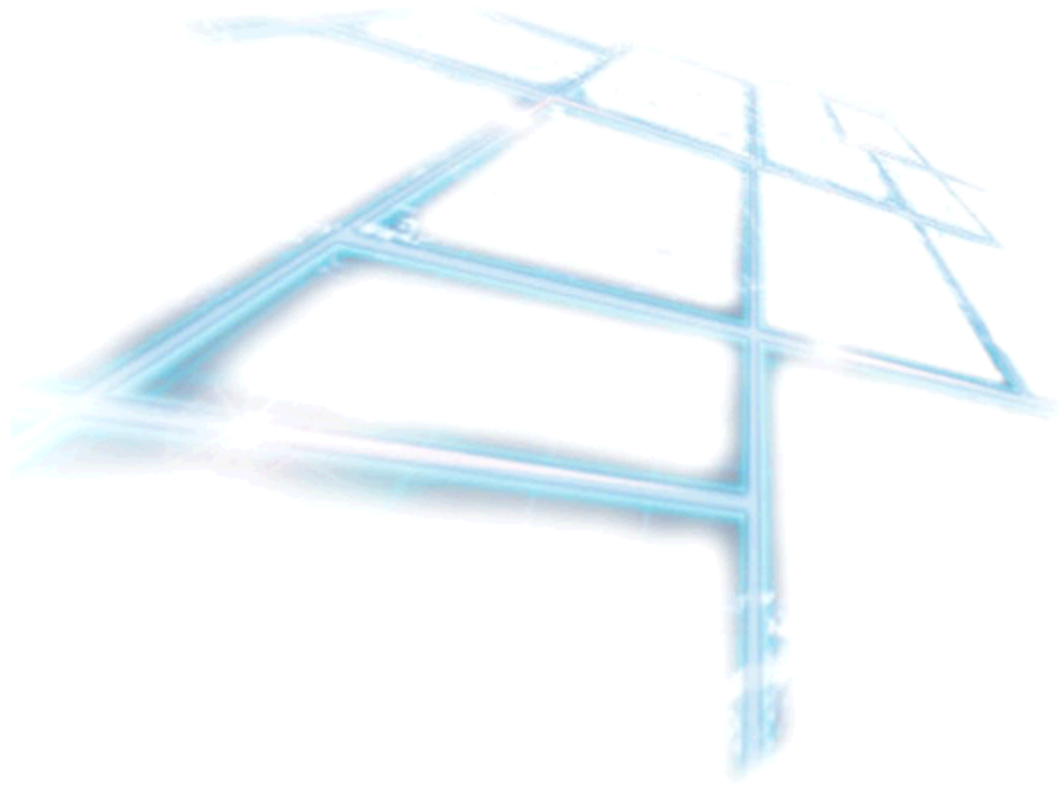


PARPT100



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Wesseling, Oktober 2010 Version 4.3.1

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1.1 Introduction

Congratulations! You've bought a QUANCOM high quality measurement and automation board, which shows the newest update of technology and whose attributes and functions are able to compete with every other instrument and even beats them. The following special attributes are included:

Features of the board:

- Mountable to a mounting-rail
- Uncomplicated connection of Pt100 temperature-resistors to A/D-converters
- Huge measurement-range with high accuracy
- Simple temperature calculation
- Easy, simple and individual connection

1.2 Our experience is your profit

We from QUANCOM are specialists for the development of hard- and software. QUANCOM has grown to become one of the leading suppliers of measuring and automation technology to industry. At its design centres QUANCOM has developed an impressive range of products.

1.3 Customer Communication

QUANCOM wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, this manual contains comment and configuration forms for you to complete. These forms are in chapter "**Customer Communication and Help**" at the end of this manual.

1.4 Changes in this manual and software updates

QUANCOM - products are marked out by their constant further development. You can watch all the actual information of the changes in the README-file on the installation disk or CD. You can always get more information and free software updates on our internet website.

www.quancom.de

1.5 Extend of delivery

- Resistance-to-voltage converter
- User's manual

If a component is missing please contact your dealer. QUANCOM reserves the right to change the extent of delivery without a preliminary announcement.

Platinum resistance thermometers (PRTs) are common used thermometers because of their large measurement range and their simple handling. Through a nearly linear temperature / resistance relationship the conversion from the measured resistance to a corresponding temperature is easy. But a direct measurement of resistance isn't that easy with modern protocol- and controlling hardware which is used. All this hardware is designed to measure voltages or currents, but not to measure resistance. For that we developed a module to convert the resistance of a PRT (Pt100) into a voltage from 0V to 10V. With this module you can connect a Pt100 to a A/D-converter card. If you use one of our A/D-cards, you may use QLIB-commands to convert the measured voltage to a temperature. With a supply voltage of 8V to 24V the module is easily powered.

The module PARPT100 measures the resistance of the PRT through a current of 1mA, generated by a high accuracy constant-current-source, which is less enough to prevent the Pt100 to be heated through measurement current. The voltage drop over the PRT (0 to 400mV) is measured and amplified to an output of 0V to 10V. To detect small changes of resistance without distortion by internal noise we only used high quality low noise operation amplifiers. The output of the PARPT100 can be measured with an A/D converter with an input-range of 0V to 10V.

The resistance of the PRT can be calculated as the following formula shows.

$$R_{PT100} = U_a * 40$$

With the calculated resistance the temperature can be determined with the table show in chapter "[Temperature-table of Pt100 complying to DIN IEC751](#)".

To calculate the temperature directly see chapter "[Calculating the resistance](#)".

To let you handle all this conversions easier and to make you the usage of this module as easy as possible, we implemented conversion-commands into our QLIB.

With the use of one of our A/D-cards you simply can do the following command sequence to measure the temperature of a PRT.

1. reading the value of an A/D channel

QAPIGetAD()

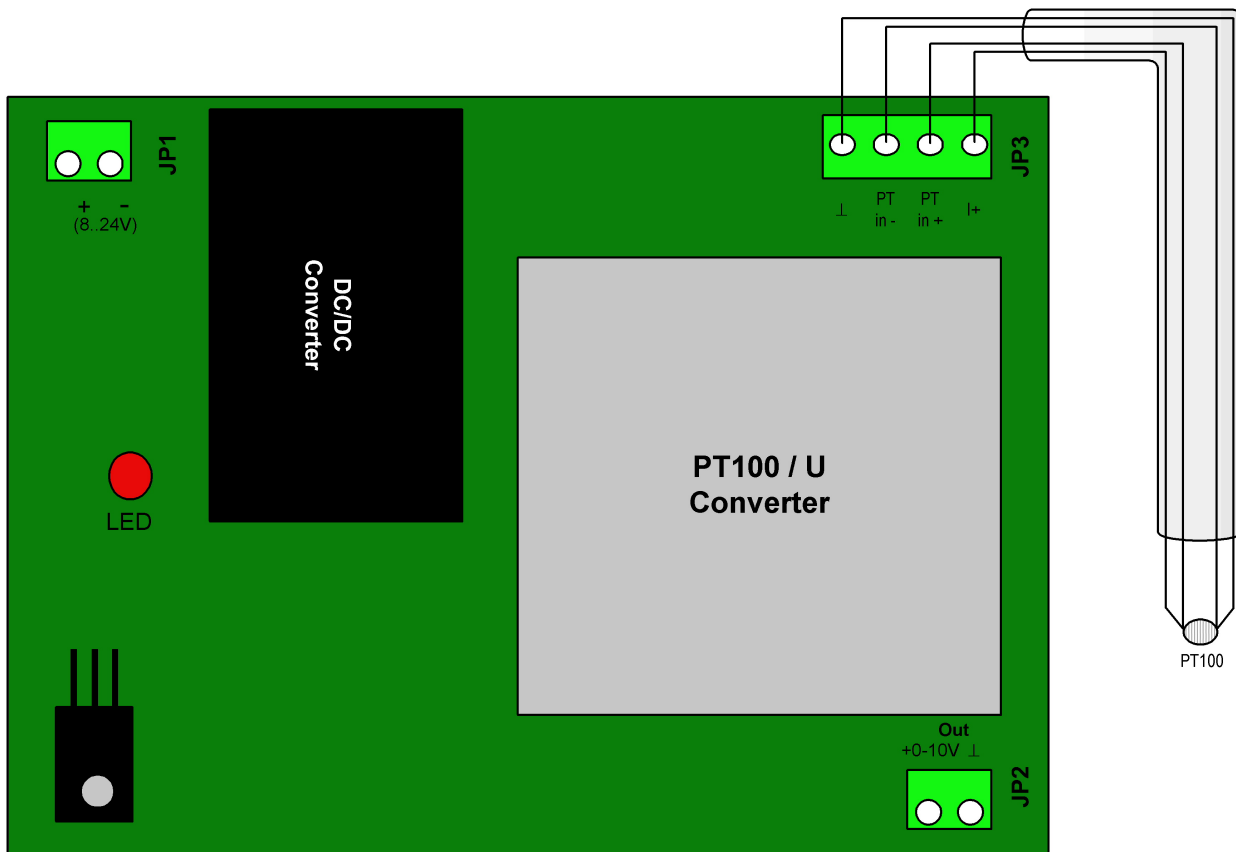
2. converting the value to a corresponding voltage

QAPICovertDWTtoVoltage()

3. converting the voltage to temperature

QAPIConvertPT100VoltageToTemp()

- **Pt100 temperature range:** -200°C to 850°C (-328°F to 1562°F)
- **Pt100 Wiring techniques:** 2, 3 or 4 wire technique
- **Supply Voltage:** 8V ... 24V
- **Output voltage:** 0 - 10 V
- **Wire size:** up to 1.0 mm²
- **Ambient temperature:** 0...70 °C



Connectors:

JP1: (power supply)

- : Vdd (GND)
- + : Vss (positive voltage)

JP2: (output)

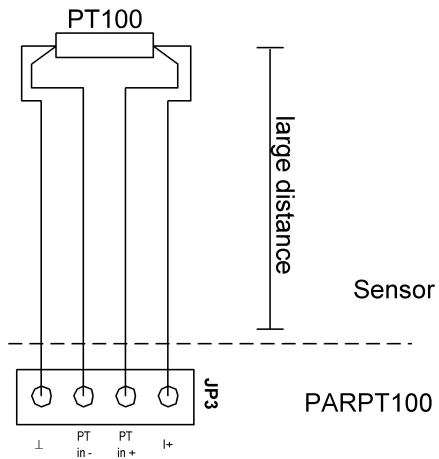
- GND : low-potential of the output-signal
- 0-10V : output-signal

JP3: (Pt100 connector)

- GND : measurement current low-potential
- PT in - : Pt100 connection low
- PT in + : Pt100 connection high
- I+ : current source (1mA)

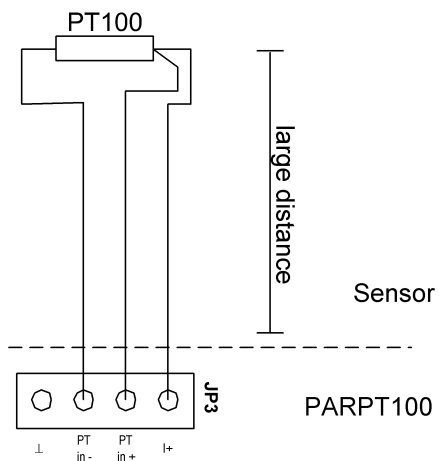
4.1 Connection examples for 2, 3 and 4-wire-techniques

4.1.1 Connection example for 4 wire-techniques



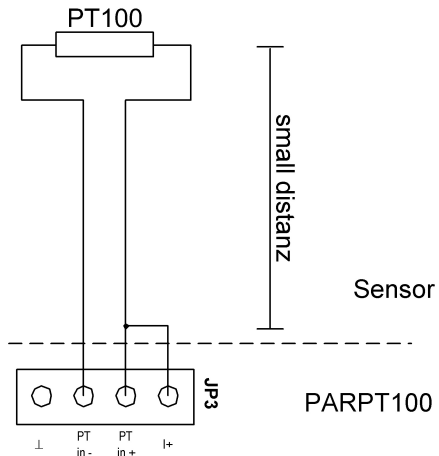
No or only small measurement error because of wire-length.

4.1.2 Connection example for 3 wire-techniques



With same wires to Pt100 no or small measurement error because of wire-length.

4.1.3 Connection example for 2 wire-techniques



Measurement errors occur, only usable for short distances.

4.2 Temperature-table of Pt100 complying to DIN IEC751

θ (°C)	R(Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	Maximum error θ in °C	Kl. A	Kl. B
		θ + 1°C	θ + 2°C	θ + 3°C	θ + 4°C	θ + 5°C	θ + 6°C	θ + 7°C	θ + 8°C	θ + 9°C			
-200	18,49	18,93	19,36	19,79	20,22	20,65	21,08	21,51	21,94	22,37	± 0,55	± 1,30	
-190	22,80	23,23	23,66	24,09	24,52	24,94	25,37	25,80	26,23	26,65	± 0,53	± 1,25	
-180	27,08	27,50	27,93	28,35	28,78	29,20	29,63	30,05	30,47	30,90	± 0,51	± 1,20	
-170	31,32	31,74	32,16	32,59	33,01	33,43	33,85	34,27	34,69	35,11	± 0,49	± 1,15	
-160	35,53	35,95	36,37	36,79	37,21	37,63	38,04	38,46	38,88	39,30	± 0,47	± 1,10	
-150	39,71	40,13	40,55	40,96	41,38	41,79	42,21	42,63	43,04	43,45	± 0,45	± 1,05	
-140	43,87	44,28	44,70	45,11	45,52	45,94	46,35	46,76	47,18	47,59	± 0,43	± 1,00	
-130	48,00	48,41	48,82	49,23	49,64	50,06	50,47	50,88	51,29	51,70	± 0,41	± 0,95	
-120	52,11	52,52	52,92	53,33	53,74	54,15	54,56	54,97	55,38	55,78	± 0,39	± 0,90	
-110	56,19	56,60	57,00	57,41	57,82	58,22	58,63	59,04	59,44	59,85	± 0,37	± 0,85	
-100	60,25	60,66	61,06	61,47	61,87	62,28	62,68	63,09	63,49	63,90	± 0,35	± 0,80	
-90	64,30	64,70	65,11	65,51	65,91	66,31	66,72	67,12	67,52	67,92	± 0,33	± 0,75	
-80	68,33	68,73	69,13	69,53	69,93	70,33	70,73	71,13	71,53	71,93	± 0,31	± 0,70	
-70	72,33	72,73	73,13	73,53	73,93	74,33	74,73	75,13	75,53	75,93	± 0,29	± 0,65	
-60	76,33	76,73	77,13	77,52	77,92	78,32	78,72	79,11	79,51	79,91	± 0,27	± 0,60	
-50	80,31	80,70	81,10	81,50	81,89	82,29	82,69	83,08	83,48	83,88	± 0,25	± 0,55	
-40	84,27	84,67	85,06	85,46	85,85	86,25	86,64	87,04	87,43	87,83	± 0,23	± 0,50	
-30	88,22	88,62	89,01	89,40	89,80	90,19	90,59	90,98	91,37	91,77	± 0,21	± 0,45	
-20	92,16	92,55	92,95	93,34	93,73	94,12	94,52	94,91	95,30	95,69	± 0,19	± 0,40	
-10	96,09	96,48	96,87	97,26	97,65	98,04	98,44	98,83	99,22	99,61	± 0,17	± 0,35	
0	100,00	100,39	100,78	101,17	101,56	101,95	102,34	102,73	103,12	103,51	± 0,15	± 0,30	
10	103,90	104,29	104,68	105,07	105,46	105,85	106,24	106,63	107,02	107,40	± 0,17	± 0,35	
20	107,79	108,18	108,57	108,96	109,35	109,73	110,12	110,51	110,90	111,28	± 0,19	± 0,40	
30	111,67	112,06	112,45	112,83	113,22	113,61	113,99	114,38	114,77	115,15	± 0,21	± 0,45	
40	115,54	115,93	116,31	116,70	117,08	117,47	117,85	118,24	118,62	119,01	± 0,23	± 0,50	
50	119,40	119,78	120,16	120,55	120,93	121,32	121,70	122,09	122,47	122,86	± 0,25	± 0,55	
60	123,24	123,62	124,01	124,39	124,77	125,16	125,54	125,92	126,31	126,69	± 0,27	± 0,60	
70	127,07	127,45	127,84	128,22	128,60	128,98	129,37	129,75	130,13	130,51	± 0,29	± 0,65	
80	130,89	131,27	131,66	132,04	132,42	132,80	133,18	133,56	133,94	134,32	± 0,31	± 0,70	
90	134,70	135,08	135,46	135,84	136,22	136,60	136,98	137,36	137,74	138,12	± 0,33	± 0,75	
100	138,50	138,88	139,26	139,64	140,02	140,39	140,77	141,15	141,53	141,91	± 0,35	± 0,80	
110	142,29	142,66	143,04	143,42	143,80	144,17	144,55	144,93	145,31	145,68	± 0,37	± 0,85	
120	146,06	146,44	146,81	147,19	147,57	147,94	148,32	148,70	149,07	149,45	± 0,39	± 0,90	
130	149,82	150,20	150,57	150,95	151,33	151,70	152,08	152,45	152,83	153,20	± 0,41	± 0,95	
140	153,58	153,95	154,32	154,70	155,07	155,45	155,82	156,19	156,57	156,94	± 0,43	± 1,00	
150	157,31	157,69	158,06	158,43	158,81	159,18	159,55	159,93	160,30	160,67	± 0,45	± 1,05	
160	161,04	161,42	161,79	162,16	162,53	162,90	163,27	163,65	164,02	164,39	± 0,47	± 1,10	
170	164,76	165,13	165,50	165,87	166,24	166,61	166,98	167,35	167,72	168,09	± 0,49	± 1,15	
180	168,46	168,83	169,20	169,57	169,94	170,31	170,68	171,05	171,42	171,79	± 0,51	± 1,20	
190	172,16	172,53	172,90	173,26	173,63	174,00	174,37	174,74	175,10	175,47	± 0,53	± 1,25	
200	175,84	176,21	176,57	176,94	177,31	177,68	178,04	178,41	178,78	179,14	± 0,55	± 1,30	
210	179,51	179,88	180,24	180,61	180,97	181,34	181,71	182,07	182,44	182,80	± 0,57	± 1,35	
220	183,17	183,53	183,90	184,26	184,63	184,99	185,36	185,72	186,09	186,45	± 0,59	± 1,40	
230	186,82	187,18	187,54	187,91	188,27	188,63	189,00	189,36	189,72	190,09	± 0,61	± 1,45	
240	190,45	190,81	191,18	191,54	191,90	192,26	192,63	192,99	193,35	193,71	± 0,63	± 1,50	
250	194,07	194,44	194,80	195,16	195,52	195,88	196,24	196,60	196,96	197,33	± 0,65	± 1,55	
260	197,69	198,05	198,41	198,77	199,13	199,49	199,85	200,21	200,57	200,93	± 0,67	± 1,60	
270	201,29	201,65	202,01	202,36	202,72	203,08	203,44	203,80	204,16	204,52	± 0,69	± 1,65	
280	204,88	205,23	205,59	205,95	206,31	206,67	207,02	207,38	207,74	208,10	± 0,71	± 1,70	
290	208,45	208,81	209,17	209,52	209,88	210,24	210,59	210,95	211,31	211,66	± 0,73	± 1,75	
300	212,02	212,37	212,73	213,09	213,44	213,80	214,15	214,51	214,86	215,22	± 0,75	± 1,80	
310	215,57	215,93	216,28	216,64	216,99	217,35	217,70	218,05	218,41	218,76	± 0,77	± 1,85	
320	219,12	219,47	219,82	220,18	220,53	220,88	221,24	221,59	221,94	222,29	± 0,79	± 1,90	
330	222,65	223,00	223,35	223,70	224,06	224,41	224,76	225,11	225,46	225,81	± 0,81	± 1,95	
340	226,17	226,52	226,87	227,22	227,57	227,92	228,27	228,62	228,97	229,32	± 0,83	± 2,00	
350	229,67	230,02	230,37	230,72	231,07	231,42	231,77	232,12	232,47	232,82	± 0,85	± 2,05	
360	233,17	233,52	233,87	234,22	234,56	234,91	235,26	235,61	235,96	236,31	± 0,87	± 2,10	
370	236,65	237,00	237,35	237,70	238,04	238,39	238,74	239,09	239,43	239,78	± 0,89	± 2,15	
380	240,13	240,47	240,82	241,17	241,51	241,86	242,20	242,55	242,90	243,24	± 0,91	± 2,20	
390	243,59	243,93	244,28	244,62	244,97	245,31	245,66	246,00	246,35	246,69	± 0,93	± 2,25	
400	247,04	247,38	247,73	248,07	248,41	248,76	249,10	249,45	249,79	250,13	± 0,95	± 2,30	

ϑ (°C)	R(Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	R (Ω)	Zulässiger Fehler bei ϑ in °C	
		$\vartheta + 1^{\circ}\text{C}$	$\vartheta + 2^{\circ}\text{C}$	$\vartheta + 3^{\circ}\text{C}$	$\vartheta + 4^{\circ}\text{C}$	$\vartheta + 5^{\circ}\text{C}$	$\vartheta + 6^{\circ}\text{C}$	$\vartheta + 7^{\circ}\text{C}$	$\vartheta + 8^{\circ}\text{C}$	$\vartheta + 9^{\circ}\text{C}$	Kl. A	Kl. B
410	250,48	250,82	251,16	251,50	251,85	252,19	252,53	252,88	253,22	253,56	± 0,97	± 2,35
420	253,90	254,24	254,59	254,93	255,27	255,61	255,95	256,29	256,64	256,98	± 0,99	± 2,40
430	257,32	257,66	258,00	258,34	258,68	259,02	259,36	259,70	260,04	260,38	± 1,01	± 2,45
440	260,72	261,06	261,40	261,74	262,08	262,42	262,76	263,10	263,43	263,77	± 1,03	± 2,50
450	264,11	264,45	264,79	265,13	265,47	265,80	266,14	266,48	266,82	267,15	± 1,05	± 2,55
460	267,49	267,83	268,17	268,50	268,84	269,18	269,51	269,85	270,19	270,52	± 1,07	± 2,60
470	270,86	271,20	271,53	271,87	272,20	272,54	272,88	273,21	273,55	273,88	± 1,09	± 2,65
480	274,22	274,55	274,89	275,22	275,56	275,89	276,23	276,56	276,89	277,23	± 1,11	± 2,70
490	277,56	277,90	278,23	278,56	278,90	279,23	279,56	279,90	280,23	280,56	± 1,13	± 2,75
500	280,90	281,23	281,56	281,89	282,23	282,56	282,89	283,22	283,55	283,89	± 1,15	± 2,80
510	284,22	284,55	284,88	285,21	285,54	285,87	286,21	286,54	286,87	287,20	± 1,17	± 2,85
520	287,53	287,86	288,19	288,52	288,85	289,18	289,51	289,84	290,17	290,50	± 1,19	± 2,90
530	290,83	291,16	291,49	291,81	292,14	292,47	292,80	293,13	293,46	293,79	± 1,21	± 2,95
540	294,11	294,44	294,77	295,10	295,43	295,75	296,08	296,41	296,74	297,06	± 1,23	± 3,00
550	297,39	297,72	298,04	298,37	298,70	299,02	299,35	299,68	300,00	300,33	± 1,25	± 3,05
560	300,65	300,98	301,31	301,63	301,96	302,28	302,61	302,93	303,26	303,58	± 1,27	± 3,10
570	303,91	304,23	304,56	304,88	305,20	305,53	305,85	306,18	306,50	306,82	± 1,29	± 3,15
580	307,15	307,47	307,79	308,12	308,44	308,76	309,09	309,41	309,73	310,05	± 1,31	± 3,20
590	310,38	310,70	311,02	311,34	311,67	311,99	312,31	312,63	312,95	313,27	± 1,33	± 3,25
600	313,59	313,92	314,24	314,56	314,88	315,20	315,52	315,84	316,16	316,48	± 1,35	± 3,30
610	316,80	317,12	317,44	317,76	318,08	318,40	318,72	319,04	319,36	319,68	± 1,37	± 3,35
620	319,99	320,31	320,63	320,95	321,27	321,59	321,91	322,22	322,54	322,86	± 1,39	± 3,40
630	323,18	323,49	323,81	324,13	324,45	324,76	325,08	325,40	325,72	326,03	± 1,41	± 3,45
640	326,35	326,66	326,98	327,30	327,61	327,93	328,25	328,56	328,88	329,19	± 1,43	± 3,50
650	329,51	329,82	330,14	330,45	330,77	331,08	331,40	331,71	332,03	332,34	± 1,45	± 3,55
660	332,66	332,97	333,28	333,60	333,91	334,23	334,54	334,85	335,17	335,48		± 3,60
670	335,79	336,11	336,42	336,73	337,04	337,36	337,67	337,98	338,29	338,61		± 3,65
680	338,92	339,23	339,54	339,85	340,16	340,48	340,79	341,10	341,41	341,72		± 3,70
690	342,03	342,34	342,65	342,96	343,27	343,58	343,89	344,20	344,51	344,82		± 3,75
700	345,13	345,44	345,75	346,06	346,37	346,68	346,99	347,30	347,60	347,91		± 3,80
710	348,22	348,53	348,84	349,15	349,45	349,76	350,07	350,38	350,69	350,99		± 3,85
720	351,30	351,61	351,91	352,22	352,53	352,83	353,14	353,45	353,75	354,06		± 3,90
730	354,37	354,67	354,98	355,28	355,59	355,90	356,20	356,51	356,81	357,12		± 3,95
740	357,42	357,73	358,03	358,34	358,64	358,95	359,25	359,55	359,86	360,16		± 4,00
750	360,47	360,77	361,07	361,38	361,68	361,98	362,29	362,59	362,89	363,19		± 4,05
760	363,50	363,80	364,10	364,40	364,71	365,01	365,31	365,61	365,91	366,22		± 4,10
770	366,52	366,82	367,12	367,42	367,72	368,02	368,32	368,63	368,93	369,23		± 4,15
780	369,53	369,83	370,13	370,43	370,73	371,03	371,33	371,63	371,93	372,22		± 4,20
790	372,52	372,82	373,12	373,42	373,72	374,02	374,32	374,61	374,91	375,21		± 4,25
800	375,51	375,81	376,10	376,40	376,70	377,00	377,29	377,59	377,89	378,19		± 4,30
810	378,48	378,78	379,08	379,37	379,67	379,97	380,26	380,56	380,85	381,15		± 4,35
820	381,45	381,74	382,04	382,33	382,63	382,92	383,22	383,51	383,81	384,10		± 4,40
830	384,40	384,69	384,98	385,28	385,57	385,87	386,16	386,45	386,75	387,04		± 4,45
840	387,34	387,63	387,92	388,21	388,51	388,80	389,09	389,39	389,68	389,97		± 4,50
850	390,26	390,55	390,85	391,14	391,43	391,72	392,01	392,30	392,60	392,89		± 4,55

Values and tolerances complying to DIN IEC 751 of Pt100 PRT's

4.2.1 Calculating the resistance

Between values of the temperatures are es follow calculate:

- For temperatures from -200°C to 0°C

$$R_{\vartheta} = 100 + (1 + 3,90802 * 10e^{-3} * \vartheta - 0,580195 * 10e^{-6} * \vartheta^2 - 4,27350 * 10e^{-12} * (\vartheta - 100) * \vartheta^3)$$

- For temperatures from 0°C to 850°C

$$R_{\vartheta} = 100 + (1 + 3,90802 * 10e^{-3} * \vartheta - 0,580195 * 10e^{-6} * \vartheta^2)$$

Calculating the output voltage of PARPT100:

$$U_{PARPT100} = R_{PT100} * I_{PT100} * V_{PARPT100}$$

where $V_{PARPT100}$ was set to 25 and I_{PT100} was adjusted to 1 mA.

4.2.2 Evaluated Values

Temperature [°C]	Resistant [W]	Output Voltage PARPT100 [V]
-200,00C	18,49	0,4623
-100,00	60,25	1,5063
0,00	100,0	2,5000
100,00	138,5	3,4625
131,02	150,207	3,7552
266,00	199,848	4,9962
320,00	219,12	5,4780
847,57	389,551	9,7388

Table 41 Evaluated Values for PARPT100

5.1 Customer Communication and Help



You need Help ?

If you don't know how to go on during the installation or operation of your QUANCOM board please first read this user's guide.

! Tip !

On the QUANCOM installation CD you can find a ASCII – Text – file README.TXT, which includes changes made after printing this user's manual.

! Important !

If you have further questions please contact our support team and have the following information handy:

- Exact type of board
- Operating system, hardware equipment and Bus-System
- Name and Version of the program, where the error is reported.
- A detailed failure description. To make sure, please try to reproduce the failure, describe it as exact as possible, and which steps led to this failure.

Who can you contact?

The QUANCOM internet website
www.quancom.de

Per Fax
+49 22 36 / 89 92 - 49

Per e-mail:
support@quancom.de

Address:
QUANCOM INFORMATIONSSYSTEME GmbH
In der Flecht 14
D-50389 Wesseling
Germany

If you need urgent help call:

QUANCOM Hotline Germany
+49 22 36 / 89 92 - 20

Monday-Thursday
from 9:00 to 18:00
Friday
from 9:00 to 17:00

Actual drivers

You can find the newest Version of QUANCOM software on our internet website www.quancom.de. You can also find a lot of information and "Frequently asked questions (FAQ's)". Before you contact the QUANCOM support, please check if you are using the newest software version of the QUANCOM software.

Reparatur

If you are not sure whether your QUANCOM board is defective please call the QUANCOM Hotline:

Tel.: **+49 22 36 / 89 92 – 20**

Before you send us the QUANCOM board to be

repaired call:

Tel.: +49 22 36 / 89 92 – 20

If you send us your QUANCOM board, please use original package or any other suitable package, to protect the contents against transport damage. You also need to send us a copy of the original bill and the RMA number.

You can shorten the repair time by sending us an exact failure description, so that a faster failure search is possible. Send your QUANCOM board directly to the service department of QUANCOM Informations-systeme GmbH.

5.2 Technical support form

If you have internet access please enter the following URL in your browser:

<http://www.quancom.de/quancom/qshop.nsf/techniksupport?OpenForm&eng>

else photocopy this form and use the copy of this form as a reference for your current configuration. Complete this form before contacting QUANCOM Informationssysteme GmbH for technical support and our applications engineers may answer your questions more efficiently. If you are using any other QUANCOM hardware or software products please add them to this configuration form. Include additional pages if necessary.

Name: _____

Company: _____

Address: _____

Phone: _____

Fax: _____

Computer brand / Processor: _____

Operating system: _____

Display adapter: _____

Mouse: _____

QUANCOM board _____

Other adapters installed: _____

Hard disk (Capacity, free): _____

The Problem is: _____

List any error messages: _____

The following steps cause the problem to recur:

5.3 Documentation Comment Form

QUANCOM Informationssysteme GmbH would like you to comment on the documentation supplied with our products. This information helps us to provide you with quality products to meet your needs. Include additional pages if necessary.

Title: PARPT100

Edition Date: 19.10.2010

Please comment on the completeness, clarity, and organisation of the manual. If you find errors in the manual, please record the page numbers and describe the errors.

Thank you for your help.

Name: _____
Company: _____
Address: _____
Phone: _____
Fax: _____
Comment: _____

Mail to: support@quancom.de

Fax to: +49 2236 89 92 49

Address: QUANCOM Informationssysteme GmbH
In der Flecht 14
50389 Wesseling
Germany

5.4 Hardware and Software configuration form

This form helps you to list your hardware and software settings. Complete this form each time you change your software or hardware configuration, and use this form as a reference for your current configuration. Complete this form accurately before contacting QUANCOM Informationssysteme GmbH for technical support, so that our applications engineers can answer your questions more efficiently.

- **QUANCOM Product:**

Name / Name of the board _____
Interrupt Level _____
DMA Channel _____
Basis I/O Address _____
Operating system _____

- **Other information**

Computer brand and model _____
Processor _____
Clock Frequency _____
Type of Video board installed _____
DOS Version _____
Programming Language _____
Programming Language Version _____

- **Other boards in System**

Basis I/O-Address of other boards _____
DMA Channels of other boards _____
Interrupt Level of other boards _____

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