

High Precision Dekade

**Series 1422-IEC, 1423-IEC
1424-IEC**

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Issue 6/99

Certificate of manufacturer

We herewith conform that the

- High Precision Resistance Dekade 1422-IEC, 1423-IEC, 1424-IEC -

meets the specification of the "Bundespost"-standard no. 1046/1984 (EMI = electromagnetic interference).

The "Deutsche Bundespost" was informed of the marketing/sale of the Dekade and is authorized to check the manufacturer samples for their EMI-performance.

burster präzisionsmeßtechnik gmbh & co kg

EG-Konformitätserklärung

Certificate of Conformity

Gemäß ISO/IEC Leitfaden 22 und EN 45014 erklärt

According to ISO/IEC guidelines 22 and EN 45014 standard

Name des Herstellers:

Manufacturer

burster präzisionsmeßtechnik gmbh & co kg

Adresse des Herstellers:

Address of the manufacturer

Talstr. 1-7.

76593 Gernsbach

daß das Produkt

Produktname:

Declares that the product with name

Hochpräzisions-Widerstands-Dekade

Modellnummer(n) (Typ):

Model / Type

1422, 1423, 1424

Produktoptionen:

Options

IEC

RS232

mit den folgenden Produktspezifikationen übereinstimmt

is conform with following specifications of product

Sicherheit:

Safety requirements

VDE 0100 Teil 410 Abs.

4.1+A2 (IEC 64)

Schutzmaßnahmen; Schutz gegen gefährliche Körperströme

Protection against electric shock

Isolationsstrecken:

*insulation against or
from house*

IEC 1010-1

EN 61010-03/94

VDE 0411 Teil 1

Sicherheitsbestimmungen für elektrische Meß-, Steuer-, Regel- und Laborgeräte.

Safety requirements for electrical equipment for measurement control and laboratory used

EMC:

*Electromagnetic
compatibility*

DIN EN 50081-2

VDE 0839 Teil 82-1

DIN EN 50082-2

VDE 0839 Teil 82-2

(VDE 843 Teil 2 bis Teil 5)

IEC 801-1 IEC 801-5

CISPR 11

DIN EN 55011 1991

VDE 0875 Teil 11 07/92

VDE 0875 Teil 211 06/93

Elektromagnetische Verträglichkeit Fachgrundnorm Störaus-
sendung *Generic emission standard Part 2: Industrial environment*

Elektromagnetische Verträglichkeit Fachgrundnorm Störfestig-
keit *Generic immunity standard Part 2: Industrial environment*

Grenzwerte und Meßverfahren für Funkstörungen von indu-
striellen, wissenschaftlichen und medizinischen Hochfrequenz-

geräten (ISM-Geräten)

*Limits and methods of measurement of radio disturbance characteris-
tics of industrial, scientific and medical (ISM) radio-frequency equip-
ment.*

Ergänzende Informationen :

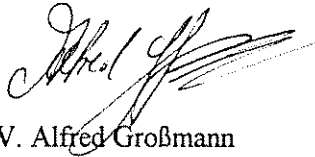
Additional Information

Gernsbach den 11.08.1995

Place / Date

Unterschrift des Herstellers
oder Einführers

Signature of manufacturer


i. V. Alfred Großmann
(Leitung Qualitätswesen)

Quality Manager

Operation Instruction for Types 1422-IEC, 1423-IEC, 1424-IEC

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1. Introduction

An IEEE-interface 488 has been fitted into our High Precision Resistance Decades, series 1420. This enables

- the remote motor driven control of your decade

or

- the read out of the set value.

Functionality of the IEEE-488 interface:

SH 1 Source Handshake
AH 1 Acceptor Handshake
L 4 Listener with address MTA
T 6 Talker with address MLA
RL 1 Full function with LWLS and RWLS
SR 1 Start of operation or indication of error
PP 1 State information - PPoll - Error
DC 1 Device Clear as group or as single unit
DT 1 Trigger function as group or as single unit

2. Address selection

The switch for IEC-address selection and for programming is available at the back plate of the instrument after opening the enclosure:

Switch 1 - 5 = unit address (binary valency 2^0 , 2^1 , 2^2 , 2^3 , 2^4),
Switch 6 - u = end characters (LF,CR,Eol)

on = 1 Switch towards front plate,
off = 0 Switch towards back plate.

The switches are clearly signed on the printed board, this enables easy setting.

The switch settings on delivery are as listed below:

unit address = 9,
end characters = CR + LF.

All sequential combinations of the end characters can be selected, for example CR+LF+Eol.

The instrument is set to a mains voltage of 220 V.

The corresponding mains fuse is 1 A slow.

The life time of our high performance switches can be extended by using our contact protection grease, type 1300-002.

3. Messages sent by the decades

Each decade of the series 14.. consists of 6 individual decades, each of them can be set from 0 to 10.

If the decade is to be controlled from 0 to 10, string variables have to be used.

The code of position 10 therefore is the hexadecimal value A.

The maximum position is AAAAAA.

Otherwise numerical and integer values can be used.
The maximum position then is 999999.

The decade is sending always 6 characters with leading zeros, for example 000000, 000001, 001298, 00AAAA.

Note:

The decade is sending no ohmic values because all decades are using the same software. You have to scale the values of the decade as follows:

Type 1422 set:value = sent value /100,
Type 1423 set:value = sent value / 10.

4. Messages accepted by the decades

Numbers can be coded as

- integers, e. g. 1234,
- floating point numbers (FPN), e. g. 1.234E3,
- character strings, e. g. 12345.

The setting 10 10 10 10 10 10 can only be sent as a string
 A A A A A A

Examples:

Computer is sending:	The Decade is set to:
integer 0<Eol>	000000
integer 12<Eol>	000012
FPN 1.23<Eol>	000001
FPN 1.23E3<Eol>	001230
FPN 999E3<Eol>	999000
integer 999000<Eol>	999000
String 'A0000A'<Eol>	10,0000,10
String 'AAAAAA'<Eol>	10,10,10,10,10,10,10

<Eol> is the end of line character.

5. SR1 and PP1 functions

No manual operation is possible, if the decade is in "remote" mode. Manual operation is only possible in "local" mode.

In "remote" mode the decade sets the decade switch to the sent set point. If this set point is not achieved, the decade tries a maximum number of 10 other times, then it stops.

SR- and PP-messages depend on the state of the interface, this enables many possible reactions of the controlling host computer to error messages (see table "error messages").

The sent status byte at SRQ is as follows:

- a) 64 = Manual operation of the decade.
- b) 65 = The decade cannot read out the set value, the decade switch is between two settings.
- c) 66 = The decade cannot turn the switch, the switch is fixed or the power supply has failed (check the fuse).

Table: SR and PPoll error messages of the decade

IEC-Bus	PPoll message	SR message	Decade status
local (LOCS)	none (false)	none (false)	no change
local with LLO (LWLS)	immediate (true)	immediate (true)	no change
remote (REMS)	immediate (true)	after 3 sec true if preceeding status is not possible	further attempt of motor control, change after 3 sec to local (LOCS)
remote with LLO (RWLS)	immediate (true)	immediate (true)	further attempts of motor control for 3 seconds, decade re- mains in "remote"

PPoll and SR status will be deleted, if one of the conditions a) - d) is true:

- a) Serving the request with SRQ,
- b) New setting of the decade by the host computer (new data),
- c) In remote mode with LLO (Rems) if the decade can be set to preceeding status,
- d) SDC or DCL-Command is sent via IEC-bus.

IEC-bus message	Decade status
GTL (go to local)	Decade changes to LOCS-status (at group or single trigger), LLO is taken into consideration and affects this message (no change).
REM (remote)	Decade changes to "remote" mode (REMS).
DCL	Pending PPoll or SRQ requests are deleted.
SDC	Pending PPoll or SRQ requests are deleted and the decade changes to "local" mode.
DC (device clear)	Programmable in group or single units.

IFC (interface clear)	The decade interface is reconfigured and pending, PPE-settings are selected.
LLO (local lockout)	at LOCS to LWLS at REMS to RWLS The decade shows various reactions to errors (see table "error messages").
PP1 (parallel poll)	PPU, PPE, PPC, PPD programming is possible, funktionalität: see table "error messages".
DT (device trigger)	Single trigger : Decade changes to "remote" mode.

Note:

If host computers do not have the GTL command, this command can be replaced by a single L output to the decade, e. g.

CBM 3032	145	Print#1, 'L'
----------	-----	--------------

6. Programming examples

Before controlling the decade via IEC-bus interface, unit addresses and end characters have to be selected (see page 1).

COMMODORE CBM 3032

If the decade is controlled by Commodore, Type CBM 3032, the CBM 3032 is controller, the decade is listener. Eol is recommended as end character.

CBM 3032	100 PRINT 'Your input please'
	110 INPUT A\$
	120 OPEN 1,9 REM 9 is the unit address
	130 PRINT#1,A\$
	140 CLOSE 1
	150 GOTO 10

Note: If the hex-number A is used in the string, this has to be entered without shift.

Reading the character string of the decade by CBM 3032:
The CBM 3032 is the controller, the decade is the talker.

CBM 3032	180 PRINT 'Reading data, start'
	190 INPUT S\$
	200 OPEN 2,9
	210 INPUT#2,B\$
	220 CLOSE 2
	230 PRINT B\$
	240 GOTO 10

TEKTRONIX 4051

If the decade is controlled by Tektronix 4051, the Tektronix is the controller, the decade is the listener. Eol is the end character.

```
4051          100 PRI 'Your input please'
              110 INP A$
              120 PRI 9:A$      REM 9 is the unit address
              130 GO TO 100
```

Reading the character string of the decade by the 4051: The 4051 is the controller, the decade is the listener.

```
4051          140 INP 9:B$      REM 9 is the unit address
              150 PRI B$
              160 GO TO 100
```

HEWLETT PACKARD HP 85

The unit address of the decade is 9, the end character is CR+LF without Eol.

If the decade is controlled by Hewlett Packard HP 85, the HP 85 is the controller, the decade is the listener.

```
HP 85          130 PRINT 'Your input please'
              140 INPUT B$
              160 OUTPUT 709;B$
              170 END
```

Reading the character string of the decade by the HP 85:
The HP 85 is the controller, the decade is the talker.

```
HP 85          500 DIM A$[6]    REM reserve 6 memory locations at least
              510 ENTER 709;A$
              520 DISP A$
              530 END
```

HEWLETT PACKARD HP9916 or HP9920

Operation of the decade as mentioned above, in addition to it rsv interrupt, SRQ operation and parallel poll setting is possible. For reactions of the decade to errors see table "error messages".

The unit address of the decade is 9, the end character is 9, the end character is CR+LF without Eol.

The programming is given in the sample programme at the end of this paragraph.

```

Program: !
  ASSIGN @Hp_ib TO (709)!9 is the decade-address,CR+LF are the end charact

COM Teststring#[15]    !Dimension of output array according to actual ne
                        !Numerical or integer variables are also possible
COM Teststringin#[6]   !The decade-data require 6 characters

Begin: !
  ON KEY 0 LABEL "With rsv + SRQ ",3 GOSUB With_srq
  ON KEY 1 LABEL "Without rsv+SRQ",3 GOSUB Without_srq
  ON KEY 2 LABEL "With PPOLL ",3 GOSUB With_ppoll
  ON KEY 3 LABEL "Without PPOLL ",3 GOSUB Without_ppoll
  ON KEY 4 LABEL "PPOLL-Byte in ",3 GOSUB Ppoll_test
  ON KEY 5 LABEL "Data-Output ",3 GOSUB Data_out
  ON KEY 6 LABEL "Data-Input ",3 GOSUB Data_in
  ON KEY 7 LABEL "Go to Local ",3 GOSUB Goto_local
  ON KEY 8 LABEL "With LLO ",3 GOSUB With_llo
  ON KEY 9 LABEL "Without LLO ",3 GOSUB Without_llo
  GOTO Begin
  !

Data_out: !
  PRINT
  ON TIMEOUT 7,1 GOSUB Er_ror
  INPUT " The decade is to set to ",Teststring$
  OUTPUT @Hp_ib;Teststring$
  RETURN
  !

Data_in: !
  PRINT
  ON TIMEOUT 7,1 GOSUB Er_ror
  ENTER @Hp_ib;Teststringin$ !CR+LF END
  PRINT " The decade is set to ";Teststringin$
  RETURN
  !

Er_ror: !
  PRINT " The IEC-BUS does not answer"
  RETURN
  !

Goto_local: !
  LOCAL @Hp_ib !Switch the decade to local
  PRINT " Switched to local"
  RETURN
  !

Inter_rupt: !
  Serpoll=SPOLL(@Hp_ib) !SRQ-input has requested for an interrupt
  PRINT CHR$(10),CHR$(10)
  PRINT "Serial Poll has been performed. Error-byte ",Serpoll
  IF Serpoll=64 THEN
    PRINT "The decade cannot turn the motor "
  END IF
  !
  IF Serpoll=65 THEN
    PRINT "The decade cannot read out the actual switch setting "
  END IF
  !
  IF Serpoll=66 OR 67 THEN
    PRINT "Do not touch the switch in remote mode,perform GTL before"
  END IF
  ENABLE INTR 7;2
  RETURN

T1: !
  !

With_ppoll: !
  INPUT "Enter the address of the status bits (0 to 7) ",Statusbit_adres
  IF Statusbit_adres>7 THEN
    PRINT "Adress of statusbit exceed adress range,only 0 to 7"
    GOTO With_ppoll
  
```

```

END IF
Sense_in: !
INPUT "Enter the valency of the bit at <true> (1 or 0)", Sence_bit
IF Sence_bit > 1 THEN Sense_in          ! only 1 or 0
Sence_bit = Sence_bit * 8              ! to line 5
Pol_enable = Statusbit_adres + Sence_bit
PPOLL CONFIGURE @Hp_ib; Pol_enable
ON INTR 7,2 GOSUB Ppoll_int
ENABLE INTR 7;2
PRINT " Parallel Poll enabled"
RETURN
!
Without_ppoll: !
PPOLL UNCONFIGURE 7                    ! all units at the IEC-BUS
PPOLL UNCONFIGURE @Hp_ib              ! or only one decade
PRINT " Parallel Poll disabled"
RETURN
!
Ppoll_int: !
PRINT CHR$(10), CHR$(10)
PRINT "The computer has performed an PPOLL"
GOSUB Inter_rupt                      ! Preform SRQ and release the line
ENABLE INTR 7;2
RETURN
!
Ppoll_test: !
Ppoll_status = PPOLL(7)
PRINT " At PPoll request the status byte was= "; Ppoll_status
RETURN
!
With_llo: !
LOCAL LOCKOUT 7
PRINT " The IEC-Bus has LLO =LOCAL LOCKOUT Status "
RETURN
!
Without_llo: !
LOCAL 7                                ! REN-line to 1 (false)
REMOTE 7                               ! REN-line to 0 (true)
                                           ! IEC BUS has been released
PRINT " LLO status of the IEC-BUS has been deleted"
RETURN
!
With_srq: !
ON INTR 7 GOSUB Inter_rupt
ENABLE INTR 7;2
PRINT CHR$(10), CHR$(10)
PRINT " INTERRUPT is enabled"
RETURN
!
Without_srq: !
DISABLE INTR 7
PRINT " INTERRUPT is disabled"
RETURN
END

```

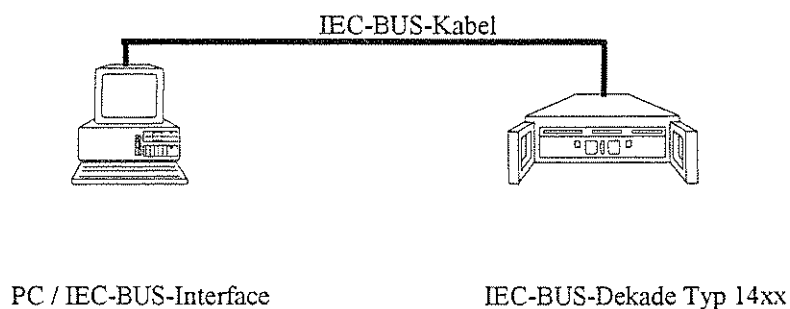
Zusatz zu Bedienungsanleitung Dekaden Typ 14xx-IEC

Jede PC-IEC-BUS-Schnittstellenkarte hat systembedingt eine eigene LISTENER (Hörer) und TALKER (Sprecher) Adresse. HP-Computer Modell 9920, HP85 etc. benutzen beispielsweise die Adresse 21 als TALKER sowie die Adresse 20 als LISTENER. Diese vom PC genutzten Adressen sind für externe Geräte nicht mehr nutzbar. Die Adresse 31 ist generell nicht nutzbar.

Welche Adresse ihre PC IEC-BUS-Interfacekarte benutzt, lesen Sie bitte in der Bedienungsanleitung.

Anmerkung: Lesen an IEC-BUS Adresse 21 geht nicht weil zwei TALKER-Geräteadressen, hier das Rechnerinterface und die IEC-BUS-Dekade, gleichzeitig antworten und sich somit gegenseitig stören. Schreiben auf zwei oder mehr IEC-BUS-LISTENER (Geräte-Adressen) geht jedoch grundsätzlich.

Lösung: Benutze andere IEC-BUS-Adresse für die Dekade. (1-30)



Addition for operating instructions decades model 14xx

Every computer interface board has an own IEC-Bus-address LISTENER and TALKER Address. HP computer model 9920, HP85 etc. use the address 21 as a (own) internal IEC-Bus-address.

The own Computer-IEC-Bus-card-address is not usable for external equipments. (Here Address 21). IEC-Bus-Address 31 is not usable.

Please, read in the operating instructions interface technician which IEC-Bus-address your computer uses.

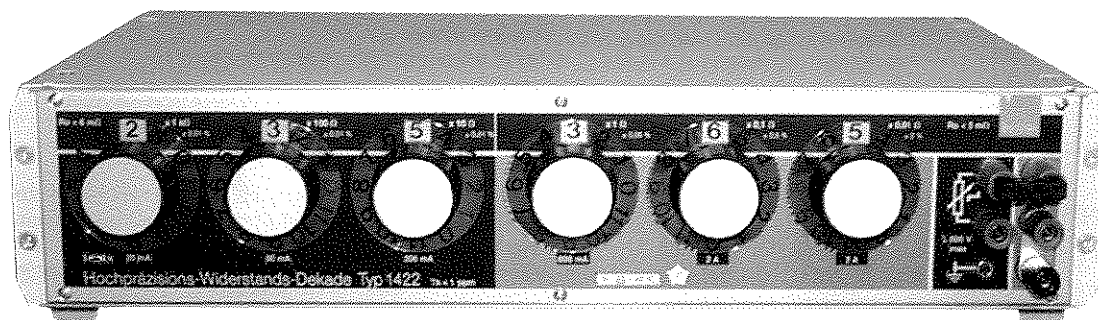
Annotation: It is not possible to read on IEC-address 21 because two equipment's answer as TALKER at the same time (computer-interface-board + external IEC-decade). However, it is possible to write on two or more IEC-Bus-addresses, LISTENER, here Address 21, simultaneously.

Solution: Use other IEC-Bus-Address on decade (1-30).

Computer Controlled High Precision Resistance Decade

Models 1422 IEC, 1423 IEC, 1424 IEC,
1422 RS232, 1423 RS232, 1424 RS232

Code: 1422 E
Manufacturer: burster
Delivery: ex stock
Warranty: 12 months
Issue: 1.10.2001



- Ranges from $10 \times 0,01 \Omega$ to $10 \times 100\,000 \Omega$
- Error tolerance 0,01 %
- Resistor material: ZERANIN®
- Temperature coefficient $\leq 2 \text{ ppm/K}$
- Long-term stability $< 0,01 \%$ over years

Application

A prime feature of the high-precision resistance decades is the design, fulfilling a host of functions. Meeting a whole range of requirements in practice they are used as

- 6-stage high-precision resistance decade
- 2 x 3-stage high-precision resistance decade
- 2 variable normal resistors
- Scalars with random-setting divider ratio

Computer Control

Each of the 3 versions - model 1422, 1423 or 1424 - is also available with computer control. IEEE488 and RS232 interfaces are available. The RS232 version is easily extended to RS485 or RS422. The stepping motors used do not alter the known high long-term stability and reproducibility of the decades with computer control either.

Description

Highest precision, temperature and long-term consistency are characteristic features of the described high-precision resistance decade. Many years of experience, tried-and-tested technology and the use of field-proven materials guarantee the high level of precision.

The decade resistors consist of low-capacity and low-inductance wire wound of Zeranin. The low temperature coefficient of this material, the low error tolerance of the resistors and the long-term stability achieved through careful artificial ageing are the guarantee for reliable conformity with the technical specifications for this decade resistor.

A specially developed precision stepping switch with high-quality contact materials and optimal brush construction guarantee very good reproducibility. The contacts are self-cleaning and virtually free of thermoelectric power. All 6 decade resistor stages are contained in an attractive 19" casing. The casing acts as screen against electrostatic interference. It is conductively connected to the earth socket on the front panel. Electrical connection of the decade resistor to the screen is possible with a connecting link.

The two sub-decades R_{D1} and R_{D2} are arranged so that they can be operated independently. An insulated plug-in link joins the two sub-decades together to form a six decade resistor. This makes the decade resistors suitable for universal applications. Very low zero-sequence resistance has been achieved by circuit optimization. This very low zero-sequence resistance is divided again if only one decade section is being used.

1422-E

Technical Data

Zero Resistance Box:

Complete Resistance Box	$\leq 11 \text{ m}\Omega$ ($9 \pm 2 \text{ m}\Omega$)
Partial Box R_{D1}	$\leq 5 \text{ m}\Omega$ ($4 \pm 1 \text{ m}\Omega$)
Partial Box R_{D2}	$\leq 6 \text{ m}\Omega$ ($5 \pm 1 \text{ m}\Omega$)

Error tolerance: 0.01 % in the main steps, see also table below

Calibration: in Ohm absolute at 23 °C

Resistance material: Zeranin®

Temperature coefficient of the individual resistances: $\leq 2 \text{ ppm/K}$

Winding structure: subdivided coils due to Chaperon

Long-term stability: $< 0.01 \%$ over years

Power dissipation: 0.4 W ($\leq 500 \text{ V}$)/individual resistance = 4 W/each decade

Operating voltage: max. 500 V ($\leq 0.4 \text{ W}$)

Test voltage: 2 kV_{eff}/50 Hz

Design and construction: according to DIN 43783, part 1 and VDE 0871/B

Switching arrangement: short - circuiting between two neighbouring contacts in the switching process

Switching positions: gradation = 12, limited to 11 steps

Contact material: Ag - plated on ECu, slider pack: of solid Ag

Operating moment: approx. 0,1 Nm

Housing: 19", 2 HE

Dimensions (length by height by depth): 445 x 90 x 285[mm]

Weight: approx. 3,2 kg; ca. 12 kg IEC-Bus-version or RS232

Tolerances, Charges

Value	Resistance tolerance %	Rated current mA
10 x 0.01 Ω	± 2	2000
10 x 0.1 Ω	± 0.5	2000
10 x 1 Ω	± 0.05	600
10 x 10 Ω	± 0.01	200
10 x 100 Ω	± 0.01	60
10 x 1 k Ω	± 0.01	20
10 x 10 k Ω	± 0.01	6
10 x 100 k Ω	± 0.01	2

Controlled via Interface

The mentioned excellent technical specifications for the high-precision resistance decade boxes are not affected by the IEC-Bus/RS232-control.

The decade resistor operates as talker and listener, making it also possible for the computer to read a manually set resistance value. The resistance decade always sends 6 characters (ASCII-code 0 - A) for this purpose, whereby all non-required conducting positions are filled with zeros.

If a computer set value is changed by hand in remote-control operation, it is immediately corrected by the decade resistor control. With the IEC-Bus versions an SRQ-call is made to the computer if this does not take place within 3s for any reason whatsoever.

If manual adjustment is required, a local command (GTL) from the computer is necessary at first.

The resistance decade always seeks the optimal path for adjustment whilst avoiding the decade position "000000" (short-circuit).

IEC-Bus Version

The IEC-Bus is connected by 24-pole plug-in connector meeting IEEE488 standards. The coding of the device address and various clearing signals are made through an 8-way DIL switch. The resistance decade is given a device address of "8" and the clearing signal "CR LF" at the factory.

The IEC-Bus-controlled decade resistors can also be operated in the "PP1" (parallel poll) mode.

RS232/485-Version

The RS232 is connected by a 25-pole Mini-D socket. The baud rate can be switched from 9600 to 4800. ANSI x 3.28 is used as transmission protocol.

Data format 8 data bit 1 stop bit are non-changeable. The parity bit can be selected from "no, even, odd". RS485 and RS422 transmission can be easily achieved through replugging internal jumpers. This makes the decade addressable and busable. The address is set by DIL switch.

Auxiliary power: 220 V $\pm 10 \%$, 50/60 Hz

Power consumption: passive approx. 18 VA, active approx. 132 VA

DKD Calibration Certificate

burster präzisionsmeßtechnik maintains a calibration station which is affiliated to the Deutsche Kalibrierdienst (DKD). Supervised by the Physikalisch-Technische Bundesanstalt (PTB) of Braunschweig, the calibration station at burster's is authorized to issue Calibration Certificates.

The Calibration Certificate shows altogether 60 values for the resistance in 10 switch positions of each decade and the inherent relative uncertainty. As experience has shown, the relative uncertainty in the upper decades amounts to only 1/3 to 1/20 of the respective error tolerance. More precise knowledge of resistance values thus means a veritable increase in value of the instrument.

Proprietary Calibration Certificate

Please refer to DKD Calibration, but the accuracy is reduced.

Wiring possibilities**High-precision resistance decade with 6 stages**

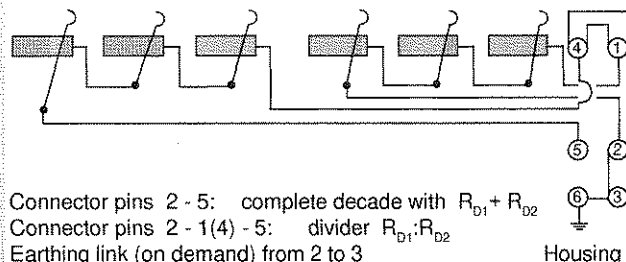
10 x (0,01 + 0,1 + 1 + 10 + 100 + 1000) Ω **1422**

10 x (0,1 + 1 + 10 + 100 + 1k + 10 k) Ω **1423**

10 x (1 + 10 + 100 + 1 k + 10 k + 100 k) Ω **1424**

Precision divider with adjustable ratios

R_{D2}			R_{D1}			
10x1k	10x100 Ω	10x10 Ω	10x1 Ω	10x0,1 Ω	10x0,01 Ω	1422
10x10k	10x1k	10x100 Ω	10x10 Ω	10x1 Ω	10x0,1 Ω	1423
10x100k	10x10k	10x1k	10x100 Ω	10x10 Ω	10x1 Ω	1424

**Two variable resistance standards**

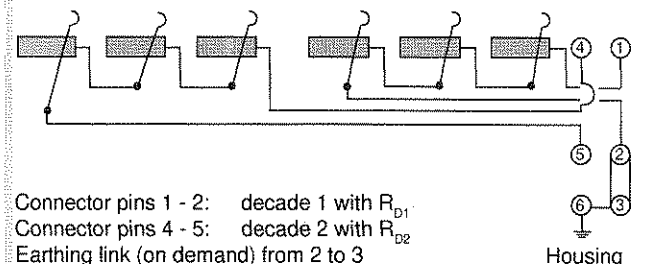
0,01 Ω - 11,1 Ω and 10 Ω - 11,1 k Ω **1422**

0,1 Ω - 111 Ω and 100 Ω - 111 k Ω **1423**

1 Ω - 1110 Ω and 1 k Ω - 1110 k Ω **1424**

Two separate high precision decades

R_{D2}			R_{D1}			
10x1k	10x100 Ω	10x10 Ω	10x1 Ω	10x0,1 Ω	10x0,01 Ω	1422
10x10k	10x1k	10x100 Ω	10x10 Ω	10x1 Ω	10x0,1 Ω	1423
10x100k	10x10k	10x1k	10x100 Ω	10x10 Ω	10x1 Ω	1424

**Order Information**

Model 142 -

Resistance range

10 x 0,01 Ω ... 10 x 1000 Ω

2

10 x 0,1 Ω ... 10 x 10 k Ω

3

10 x 1 Ω ... 10 x 100 k Ω

4

decade IEC-Bus version

- IEC

decade RS232/RS485 - version

- RS232

DKD Calibration Certificate

Order code 14DKD - Order code decade

i.e. 14DKD - 1422-RS232

Proprietary Calibration Certificate

Order code 14WKS - Order code decade

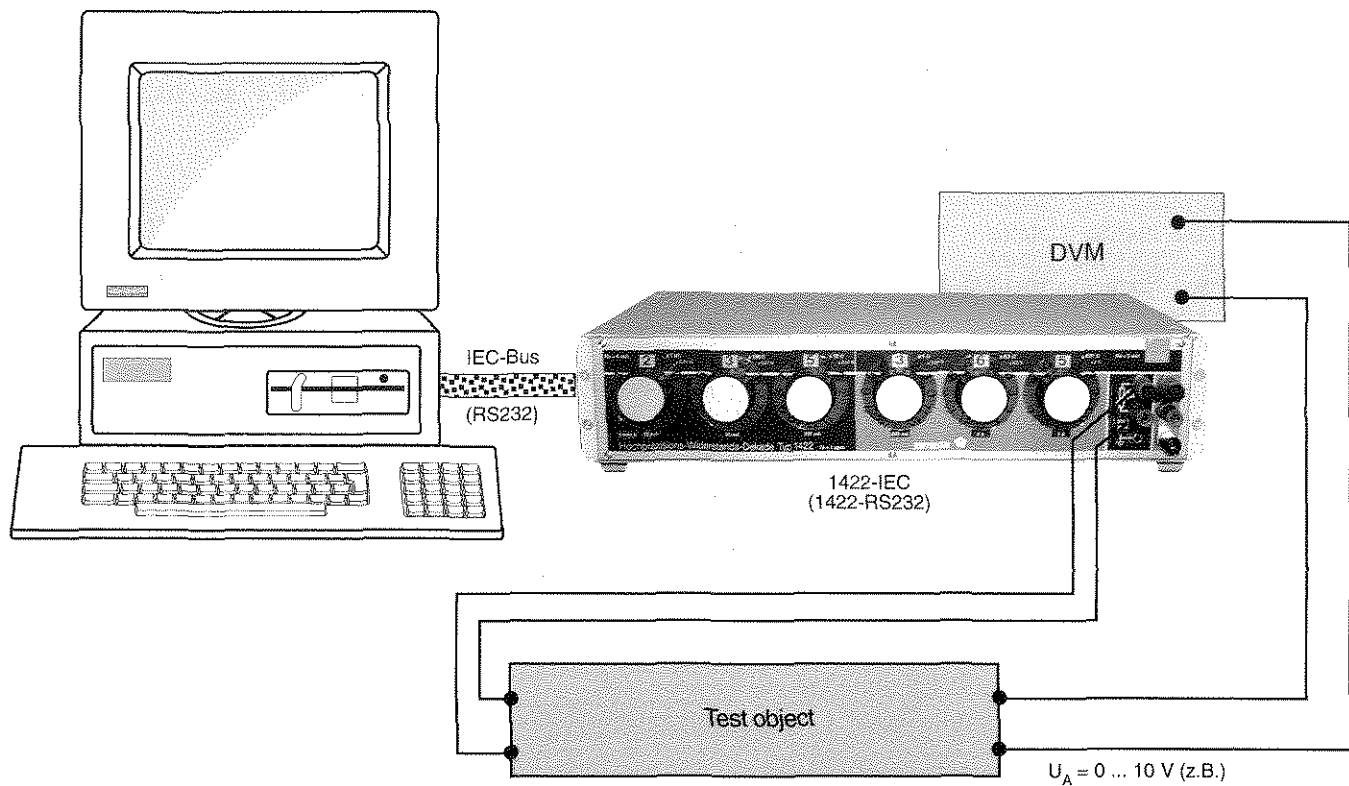
i.e. 14WKS - 1423 IEC

Accessories

Included in delivery are a connecting link to bridge the decade input with the housing and an insulated plug-in link for connecting decade R_{D1} with decade R_{D2} (1 - 4).

1 pair of mounting angles
for installation in a 19"- rack.

Model 1492-V001



Application Example

Computer-Controlled Testing of a Pt 100 amplifier

- The program queries the scanner to be simulated (i. e. Pt 100. Pt 500 etc.).
- Input of temperature values in °C.
- The program calculates the corresponding resistance value and sets decade.
- The output of the test object is measured.
- Evaluation by the computer (i. e. documentation).

Further Applications for 1422-IEC and 1422-RS232 Decades

- Controllable load resistance for automatic bridge compensation
- Controllable voltage divider for precision voltage settings etc.
- Automatic testing of ohmmeters
- Automatic testing of i.e. Pt 100 thermometers (temperature simulation)