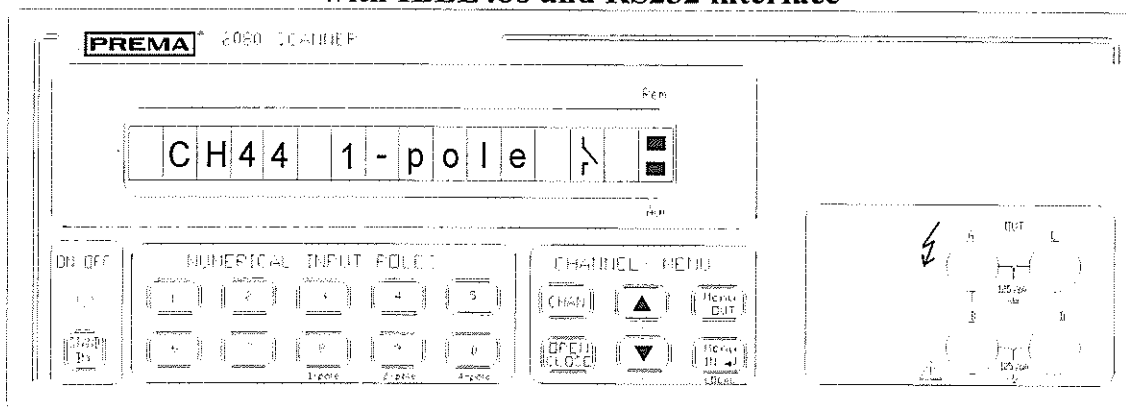


Scanner 2080

Universal Measuring Points Selector with IEEE488 and RS232 interface



Scanner 2080

User Manual

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1 Introduction

The Scanner 2080 is a measuring device which belongs to a completely new generation of instrumentation developed and manufactured by PREMA.

This device is convincing by virtue of its excellent technical measuring features and numerous functions.

1.1 Features

The following features of the Scanner 2080 are worth special mention:

- up to 80 measuring points, switch-selected
(80 x single pole, 40 x double pole, 20 x four-pole)
- short switching times
- equipped with special long-life relays
- very good insulation between the contacts
- equipped with RS232 and IEEE488 interface for integrated measuring systems.
- large clearly readable LC-display
- Standard cabinet dimensions: Half 19-inch width and 2 height units

1.2 Construction

The Scanner 2080 is a compact universal measuring points selector switch with up to 80 channels. The central microprocessor performs the control functions and interrogation/drive of the keyboard, display, IEEE and RS232 interfaces and the relay matrix. The solid pressure-cast aluminium cabinet is sectioned into two compartments. One compartment contains the microprocessor system, power supply, IEEE and RS232 interface and the display. The other compartment contains the bistable 1-, 2- and 4-pole relays.

This construction keeps thermoelectric voltages in the measuring channels small, because the sources of heat are separated from the relays in space. The use of bistable relays is a further measure to suppress thermoelectric voltages. The relays are actu-

ated with only a brief pulse so that they are not heated by continuous energising current. The two-compartment system also ensures efficient shielding of electrical interference originating from the microprocessor.

1.3 Inputs

The inputs of the multi-pole scanner channels are connected to two 50-pole subminiature-D socket connectors on the rear of the instrument. The pinout of these connectors is described in Chapter 5 „Technical data“.

1.4 Operator control

All functions of the Scanner 2080 can be controlled via the keyboard as well as via the IEEE or RS232 interface. The display field shows the operating status and the currently switched-through channel. The keyboard permits selection of the measuring channels, choice of operating mode (1-, 2- or 4-pole), opening and closing of measuring channels, entry of the IEEE device address and the end of text characters. Furthermore, the keyboard can be interrogated by a computer via the IEEE bus and alphanumeric characters can be written directly to the display. Further details are contained in Chapter 3 „Manual control“. Chapter 4 „Remote control“ contains further information on the IEEE and RS232 interfaces as well as the device-specific commands.

1.5 Important safety instructions

Reading the user manual

Proper working with this instrument is possible only after attentively reading and understanding all instructions, information and procedures. This is true in particular with respect to the safety instructions.

Please get in touch with PREMA before commencing operation of this instrument if there is anything in the user manual which you do not understand, or if any of the instructions, procedures and safety precautions are not quite clear.

This user manual has been written so that it can be used to understand this instrument and to operate it for the proper intended purpose.

It contains some important instructions for safe, proper and economical operation of this instrument.

Compliance with these instructions is necessary to avoid dangers, to reduce repair costs and downtime and to increase the life of this instrument. The user manual should always be available at the place where this instrument is operated.

Improper operator control or failure to comply with the instructions contained in this manual can endanger persons (also third parties) or lead to material damage.

Personnel entrusted with operating this instrument must have read this user manual attentively and must be familiar with all safety instructions.

The regulations for the prevention of accidents at the operating site and the relevant technical regulations for safety and professional working procedure apply in addition to this user manual.

Further safety instructions

Further safety instructions are contained in the Chapter „Commissioning“. The warning signs and symbols on the instrument, rules of behaviour and instructions for recognising specific sources of danger are explained there. It is essential to observe and comply with all safety instructions. The warning signs must be complete and kept in legible condition.

Predictability of hazards

The manufacturer cannot foresee every possible source of danger.

If a task is not performed in the recommended manner, the operator must make sure that this does not lead to any danger for himself and other persons.

The operator must also make sure that the operating mode which he has chosen does not damage or endanger the instrument.

This user manual is not a service and repair manual.

The instrument should be returned to the factory for repair.

Proprietary rights

This user manual is protected by copyright. No part thereof may be reproduced, duplicated or distributed in any form without written permission by PREMA.

Declaration of conformity (see Chapter 5.4)

PREMA has issued an EC conformity declaration for this instrument. This declaration certifies that the Scanner 2080 fulfils the relevant requirements of the following EC guidelines:

EMC directive 89/336/EEC

Low voltage equipment directive 73/23/EEC

Intended utilisation

These instruments are constructed in accordance with the accepted rules of safety engineering. Nevertheless, if they are not used in accordance with the intended applications, these instruments can be a source of danger for body and life of the user and third persons, and/or damage can result to the instrument and other objects.

Therefore the instrument may be operated only when in perfect condition, for the intended application and with awareness for considerations of safety and potential hazards, observing the user manual and the regulations for the prevention of accidents. This instrument should be used exclusively for the tasks described in this user manual.

All equipment faults which impair the safety of the user or other persons must be remedied immediately.

PREMA accepts no liability for damage resulting from improper usage of this instrument. The user alone carries the risk involved.

Availability of the user manual

The user manual must always be available at the place where this instrument is operated. Personnel entrusted with operation of the instrument must be familiar with all task sequences and safety instructions described in the user manual.

All warning and safety instructions attached to the instrument must be kept complete and in legible condition.

No modifications, attachments to or conversions of these instruments may be made without approval by PREMA, otherwise the conformity certification becomes invalid.

2 Commissioning

2.1 Delivery

Every PREMA instrument is carefully checked in detail before dispatch to make sure that it is in perfect condition fulfilling all the technical specifications.

Therefore the instrument should be in perfect electrical and mechanical condition on arrival.

The instrument should be checked immediately after arrival for any damage suffered during transportation. If there is any reason for complaint, a damage report should be drawn-up together with the person delivering the instrument.

Please check that the delivery is complete according to the following list:



1. Mains cable
2. Manual, in German (English) language
3. Product identification card - please fill-out and return to PREMA

Please also make sure that the device is set for the correct mains voltage and that the mains fuse fitted has the correct current rating for this mains voltage (see under „Connecting the instrument to the mains voltage“).

Important: Please do not discard the packaging!
when it is necessary to return the instrument to the factory for recalibration or repair, it is adequately protected against shipping damage only when sent in the original packaging.

2.2 User safety

Please also read the safety instructions in the „Introduction“ chapter.

Conformity with respect to the Product Standard EN 61010.

The Scanner 2080 has been manufactured in strict conformity with respect to EN 61010 („Safety regulations for electrically operated measuring, open and closed loop control and laboratory devices“). This ensures best possible user safety with respect to „dangerous electric current flowing through the human body“, „excessive temperature rise“ and „mechanical hazards“.

The devices may be operated only when in technically perfect and safe condition. The regulations for the prevention of accidents and for environmental protection must be observed (VBG 4 = Accident prevention regulations of the trade associations).

All switch-on and switch-off procedures described below must be complied with.

Defects such as loose connections, damaged or charred cables, oxidised contacts, damaged fuses, etc. must be remedied immediately by trained personnel.

Operating materials and replaced parts must be disposed of in accordance with the regulations for environmental protection.

Use only original replacement parts, otherwise manufacturer warranty and conformity of the devices become void.

Modifications leading to functional changes are permitted exclusively when carried out by the manufacturer or by other persons after consultation of and approval by the manufacturer.

Possible applications

These devices may be used only for the measuring functions specified in the „Technical data“. In particular, do not exceed the loading limits at the input sockets.

PREMA accepts no liability for damage resulting from improper usage not in accordance with the intended applications.

2.3 Safety symbols

The signs and symbols attached to the instrument are depicted and described below. They give important information for safety and handling of the instrument.



This symbol draws the attention of the user to a potential source of danger. Please consult the manual (see under „Connecting the measuring cables“).



This symbol draws the attention of the user to the fact that voltages dangerous with respect to human contact may be present at the measuring inputs.



The CE-designation means that the manufacturer has issued an EC conformity declaration for these devices. This declaration certifies that the instrument fulfils the relevant requirements of the EC directive.

2.4 Prevention of accidents

When operating this measuring instrument, it is necessary to observe the general conditions for the prevention of accidents in connection with utilisation of measuring equipment.

2.5 Connecting the unit to the mains voltage

This PREMA measuring device is intended for connection to alternating mains voltage with 50 Hz or 60 Hz mains frequency.

A cold equipment connector with grounding contact is provided on the rear of the instrument for connecting the mains voltage.

Before connecting the instrument to the mains voltage, please make sure that it is set to the correct mains input voltage (type specification plate/mains fuse). The voltage selector switch with integrated mains fuse is located in the left section of the cold equipment connector on which the currently set mains input voltage can be read. „220V“ stands for any mains voltages in the range from 180 V to 265 V. „110V“ stands for any mains voltage in the range from 90 V to 130 V.

To switch-over to the other mains input voltage setting, proceed as follows:



1. Disconnect the mains plug.
2. The holder for the mains fuse is located between the mains plug and the voltage selector switch. A miniature fuse with 0.4A delayed current rating is required for the „110V“ setting. The fuse rating is 0.2A delayed for the „220V“ setting. The fuse holder can be levered-out at the side using a slot screwdriver.
3. Insert the correct fuse into the holder and then push the holder back in.
4. Turn the voltage selector switch to the correct setting using a slot screwdriver, such that the white arrow above the switch points to the desired mains voltage according to the following table:

Setting	Mains voltage range
110 V	90 Vrms to 130 Vrms
220 V	180 Vrms to 265 Vrms


Table: Mains voltage ranges

2.6 Grounding

For user safety the cabinet of the instrument is grounded by connecting the mains cable to a power outlet equipped with safety grounding contact.

The cabinet is electrically isolated with respect to the input sockets and interfaces.

Furthermore, a grounding screw-terminal with the following symbol is provided on the rear of the instrument for chassis and racking ground connection:

Symbol 

2.7 Warranty

PREMA guarantees reliable functioning of the instrument for a period of two years commencing on the date of delivery.

Any repairs necessary within this period will be carried out without charging the costs.

Warranty does not cover damage caused by improper utilisation of the instrument or by exceeding the specified limiting data.

We also point out explicitly that no liability whatsoever is accepted for consequential damage (e.g. loss of data).

2.8 Switch-on

The scanner can be switched-on with the STAND-BY KEY after plugging-in the mains cable.

The device state can be saved as power-on state in the interface menu with the save settings option.

Press the STAND-BY KEY again to switch the instrument off.

The digital section remains connected to the power supply, so that the Scanner 2080 is then in standby status. The red LED at the bottom left on the front panel is lit. The analog side is powered with operating voltage in standby status so that no warm-up waiting time is necessary after switching-on again from standby status.

Otherwise the warm-up times specified in the „Technical data“ must be observed.

Note: Switching-off the instrument with the STAND-BY KEY does not disconnect the power transformer from the mains voltage.

Never disconnect the mains plug while the instrument is operating. Always first press the STAND-BY KEY !

2.9 Connecting the measuring cables

The measuring outputs have been designed as safety sockets. As far as possible, use only banana plugs with human contact protection (see Appendix A, accessories, safety cables set) for making connections to the Scanner 2080.

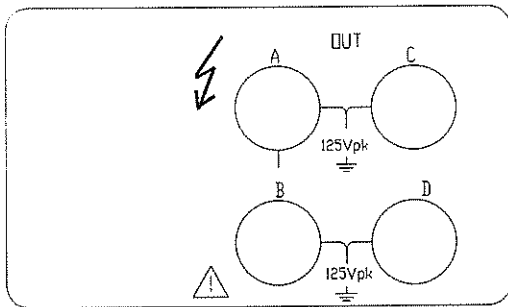


Fig.: Designation of the measuring sockets

2.10 19-inch equipment rack installation

A 19-inch racking adapter is available for the Scanner 2080.

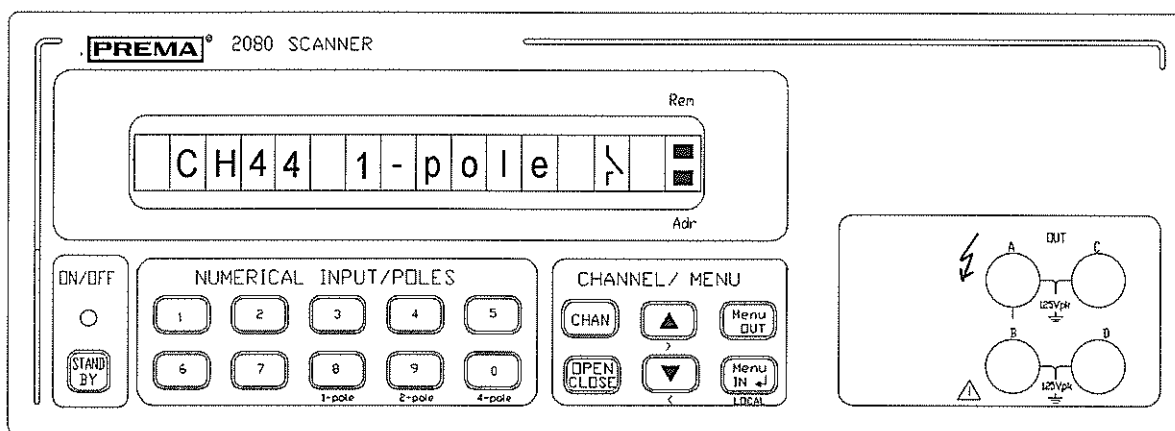
The instrument has half 19-inch width so that it can be combined with another half 19-inch device. Consult the „Accessories“ chapter for further details of 19-inch rack mounting.

When mounting the instrument in a 19-inch racking cabinet, make sure that the ventilation ports on the rear are not covered. Also provide an EMERGENCY SHUTDOWN switch in the vicinity of the instrument for immediate switch-off of the power supply in the case of imminent danger.

3 Manual control

3.1 Keyboard panel

The user-friendly design of the front panel permits quick and efficient working with this instrument. The keyboard gives direct access to important device features such as function selection and channel setting, and more complex settings are easily possible too with the cursor and menu control system.



Front view of the Scanner 2080

The numerical input / poles field

KEY	Key function
ON/OFF (StandBy)	Switches the processor section of the instrument on and off. In standby status the analog electronic circuits are still powered-up, i.e. the instrument is sooner ready for operation with full accuracy after switching-on.
0..9	Numerical input for selecting the channels
1-pole 2-pole 4-pole	Selection of the measuring configuration

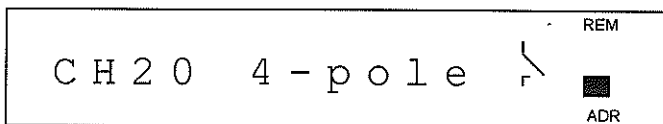
*Table: The keys in the numerical input / poles field***The channel / menu field**

Key	Function
CHAN	Permits selection of a channel.
OPEN CLOSE	Opens or closes the selected channel.
↑	Switches to the next higher channel. The cursor keys control the entry within the operator control menus.
↓	Switches to the next lower channel. The cursor keys control the entry within the operator control menus.
Menu OUT	Switches back one menu level.
Menu IN ↵	Activates menu control. Press Enter to confirm or go one level deeper.
LOCAL (Menu IN ↵)	When in remote control status, pressing this key switches the instrument to local control status.



Table: The keys in the channel / menu field

3.2 The display field

The alphanumeric LC-display shows the currently active channel, the selected measuring configuration and the status (open or closed) of the selected channel.



Display elements

2 to 5	Used to display the selected measuring channel.
7 to 12	Display the selected measuring configuration.
14	 measuring channel open or  closed.
16	REM for switching remote control ON. ADR for device talker or listener mode

3.3 Measuring inputs

The Scanner 2080 has two 50-pole subminiature-D plug connectors on the rear for connecting the measuring signals. Low thermoelectric EMF safety sockets for banana plugs are mounted on the front panel for making the connections to other instruments such as the PREMA DMM 5017.



Connecting the measuring cables

The measuring signal should always be connected such that the measuring line closest to ground potential is connected to the black input socket (LO) and the measuring line which has the higher potential is connected to the red input socket (HI). The display of the connected DMM 5017 then gives a reading with positive sign.

Please see the chapter headed „Technical data“ for the pinout of the measuring inputs on the rear of the instrument.



Limiting data of the measuring outputs

The stipulated limiting data must be taken into consideration when connecting the measuring signals. These limits are specified in red legend adjacent to the banana plugs on the front panel(Vpk means ‘peak volts’).

Connection	max. value
A	125 Vpk
B	125 Vpk
C	125 Vpk
D	125 Vpk

Table: Limiting data of the measuring outputs

3.4 Setting the functions

All functions are selected with just a single keystroke, in response to which the selected function appears immediately in the display.

3.5 Channel selection

The channels of the built-in measuring points selector switch can be chosen as follows:



Keypress	Display / Action
CHAN	Channel 12 1-pole 
MENU IN KEY	Channel 12 1-pole  permits numerical entry for the channel, using the number keys in the numerical input / poles field, at the position marked by the cursor
↑-KEY	Cursor to left (tens digit)
↓-KEY	Cursor to right (units digit)
MENU OUT KEY	terminates the entry and connects the desired channel

Table: Channel selection by direct numerical entry

3.6 Operator control of the menu structure

The first (top) menu level is recognisable by the capital letters. Options for which a lower menu level exists are here designated by two dots.

Operator control of the menus is as follows:

Keypress	Display / Action
MENU IN KEY	Activates menu control.
⬆- KEY	Within a menu level, switches to the parent menu item.
⬇-KEY	Within a menu level, switches to the child menu level.
MENU IN KEY	Selects the desired menu option. This goes one menu level lower or activates an option on the lowest level.
MENU OUT KEY	Terminates the entry and takes over the settings made. This goes one menu level higher. If pressed during numerical entry, restores the former setting.

Table: General menu control

The menu tree has the following structure:

1 INTERFACE	2 SETTINGS	3 CONTRAST	4 BEEPER
Interface 1 IEEE488 1 Address 2 * RS233 1 Xon/Xoff 2 RTS / CTS 3* no Handshake 3 Command Set 2080 2024	2 Settings 1 Save Settings 2 Load Fact. Set	1 Contrast N	4 *Beeper

Table: Menu tree structure

3.7 Interface preselection

The Scanner 2080 is equipped with a RS232 serial data communication interface and an IEEE488 interface. The interface which is to be active can be set here in this menu.

	Keypress	Display / Action
1.	MENU IN KEY	1 I n t e r f a c e . . If this display does not appear, press the $\uparrow\downarrow$ -KEYS until it does appear.
2.	MENU IN KEY	1 I E E E 4 8 8 . . Select the IEEE488 interface with the MENU IN KEY.
3.	MENU IN KEY	1 A d d r e s s 1 4 Enter the device address. Press the MENU IN KEY to terminate the entry.
4.	MENU IN KEY	Takes over the entry and goes to the next higher menu level. Press again until the display of the measurement reading reappears.

Table: Setting/configuring the IEEE488 interface

	Keypress	Display / Action
1.	MENU IN KEY	1 I n t e r f a c e . . If this display does not appear, press the $\uparrow\downarrow$ -KEYS until it does appear.
2.	MENU IN KEY	2 R S 2 3 2 . . Select the RS232 interface with the MENU IN KEY.
3.	MENU IN KEY	1 X o n / X o f f Select the handshake mode; confirm with the MENU IN KEY.
4.	MENU OUT KEY	Takes over the entry and goes to the next higher menu level. Press again until the display of the measurement reading reappears.

Table: Setting/configuring the RS232 interface

The possible handshake modes for the RS232 interface are:

- Xon / Xoff

- RTS / CTS (requires a special cable, see accessory equipment No. 3018)
- No handshake

	Keypress	Display / Action
1.	MENU IN KEY	1 Command Set.. If this display does not appear, press the $\uparrow\downarrow$ -KEYS until it does appear.
2.	MENU IN KEY	1 2080.. The 2080 command set is selected with the MENU IN KEY.
3.	MENU IN KEY	2 2024.. The 2024 command set is selected with the MENU IN KEY.
4.	MENU OUT KEY	Takes over the entry and goes to the next higher menu level. Press again until the display of the measurement reading reappears.

3.8 Saving and loading settings

The menu option „Settings“ permits saving of a power-on state or loading of the factory settings.

	Keypress	Display / Action
1.	MENU IN KEY	2 Settings.. If this display does not appear, press the \uparrow -KEY until it does appear.
2.	MENU IN KEY	1 Save Settings Saves the current instrument state as power-on state when the MENU IN KEY is pressed.
3.	\downarrow -KEY	2 Load Fact. Set Loads the factory settings on pressing the MENU IN KEY.

Table: Save instrument settings, load factory settings

Power on state

The following information items are saved as power on state:

- Channel setting
- Measuring configuration (1-pole, 2-pole, 4-pole)
- LC-display contrast
- IEEE address
- Interface parameters

3.9 Adjusting the contrast

	Keypress	Display / Action
1.	MENU IN KEY	1 Contrast: 6 If this display does not appear, press the \uparrow -KEY until it does appear.
2.	MENU IN KEY	Goes to entry mode.
3.	\uparrow -KEY	Increases the contrast by one unit.
4.	\downarrow -KEY	Decreases the contrast by one unit.
5.	MENU OUT KEY	Takes over the entry and goes to the next higher menu level. Press again until the display of the measurement reading reappears.

Table: Adjusting the contrast

The contrast can be adjusted in the range from 1 to 9 units.

3.10 Activating the loudspeaker (beeper)

	Keypress	Display / Action
1.	MENU IN KEY	4 Beeper If this display does not appear, press the $\uparrow\downarrow$ -KEYS until it does appear.
2.	MENU IN KEY	4 * Beeper The loudspeaker (beeper) is now active. An acoustic signal sounds in response to each keypress. Proceed in the same way to deactivate the beeper again.
3.	MENU OUT KEY	Takes over the entry and goes to the next higher menu level. Press again until the display of the measurement reading reappears.

3.11 Error messages

Scanner Mode? Scanner mode is unsuitable, i.e. choose a different configuration
(1-, 2- or 4-pole).

4 Remote Control

This chapter describes operation/utilisation of the Scanner 2080 in remote controlled measuring systems via the IEEE488 interface and RS232 interface.

This instrument supports both interfaces.

4.1 Configuration

Some manual configurations must be made to make it possible to control the Scanner 2080 via one of the two interfaces RS232 and IEEE488.

All necessary settings are made in the „Interface“ menu.

- Select the interface (RS232, IEEE488)
- Assign the device address for IEEE488
- Select the handshake mode for RS232

Interface selection

Select the interface, via which the instrument is to be controlled, in the menu „Interface“ (see also the chapter on „Manual control“).

The Scanner 2080 is equipped as standard features with the two most commonly used interfaces for instrumentation, IEEE488 and RS232.

Configuring of the RS232 interface

Data communication via the RS232 interface takes place with 8N1 format, i.e. using eight data bits, no parity bit and one stop bit. The transmission rate is 9600 Baud.

Handshake mode

The Scanner 2080 permits setting of various handshake modes so that this instrument can be accessed by very many RS232 control programs. Many programming languages and the Windows terminal programs use XON/XOFF handshake. A special null-modem cable is required for RTS/CTS handshake (see accessory equipment No. 3018) - it ensures quick reliable data transmission.

End recognition in RS232 data communication

The end of a transmitted or received message in RS232 data communication is marked by a „LF“ (line feed) character.

Configuring the IEEE488 interface

The device address and the end characters of the message unit (ASCII string) are of significance for communication between the controlling computer and the Scanner 2080. The IEEE address is user-definable whereas the end characters are defined by the 488.2 standard.

Setting the IEEE488 device address

The device address can be set in the menu „Interface, IEEE488“ (see also the chapter on „Manual control“) and can be saved in the power on state.
The device address in the factory settings is 7.

End recognition in the IEEE488 message transmission

The standard end characters „LF + EOI“ are used for reception and transmission of messages (ASCII strings) via the IEEE488 interface. LF stands for „line feed“ and EOI refers to an interface line which is set by hardware control.

4.2 General information for remote control

All functions which can be controlled via the keyboard can also be remotely controlled, except for the device address, which can only be set via the keyboard, and the standby function.

The first command recognised by the instrument via the interface disables the keyboard for manual control of device functions. Only the local key is active and, when pressed, cancels the keyboard disable so that keyboard manual control is then possible again.

In remote control mode the status message „Rem“ is shown in the right window of the main display.

This instrument understands up to 30 characters within a single command. All characters are ASCII characters. Several commands can be combined in a character string (e.g. „M11ON“), but some commands must be sent alone - these are ‘D1....’ and the ?-commands.

The specific commands for control and data communication via the interface must be determined by consulting the manual for the utilised IEEE bus interface, or they depend on the programming language.

Blank characters (SPACE, ASCII-code 20 H) transmitted by the computer are ignored. The instrument can receive commands (operation as LISTENER) and transmit device messages with respect to its status (operation as TALKER). In this state the message „ADR“ is shown in the display on the extreme right.

The time when the instrument transmits information can be defined by the computer. One possibility is that the computer addresses the instrument as TALKER and reads-out the device information. The second possibility is to operate the device in SRQ mode, in which the device requests service from the computer when a status change has taken place. Switchover to SRQ (service request) mode is possible by command. The basic setting after switching-on the instrument is operation without SRQ.

4.3 Capabilities of the IEEE 488 bus interface

The IEEE computer interface has the following capabilities defined by the IEEE 488 standard:

SH 1	Handshake source function
AH 1	Handshake sink function
T6	TALKER function
L3	LISTENER function
RL1	Remote control
DC1	Reset function
DT1	Trigger function
SR1	Service request function

IEEE488.1 multi-wire messages

This instrument understands the universal commands DCL, SPE and SPD. The command DCL puts the device in its basic state. Of the addressed commands it understands GTL, LLO and SDC.

The commands have the following effects:

DCL	Device Clear	Restore basic state of device
SDC	Selected Device Clear	Restore basic state of device
GTL	Go To Local	Terminate remote control mode
LLO	Local Lock Out	Device cannot be switched back to manual control via the keyboard (keyboard lock-out)
SPE	Serial Poll Enable	Prepares serial polling
SPD	Serial Poll Disable	Terminates serial polling
UNT	UnTalk	Address cancel - not displayed
UNL	UnListen	Address - not displayed
PPC, PPU, TCT		not supported

4.4 RS232 / IEEE-488.2 Common Commands

In addition to the 488.1 commands, the Scanner 2080 also understands the general commands standardised according to IEEE 488.2.

The general IEEE488.2 commands are sent to the Scanner 2080 as ASCII character string which must be prefaced by „*“.

The following commands are implemented in the Scanner 2080:

*CLS	SClear status byte (command)
*ESE	Standard event status enable (command)
*ESE?	" " " " (query)
*ESR?	Standard event status register (query)
*IDN?	Identify (query)
*OPC	Operation completed (command)
*OPC?	Operation completed (query)
*RST	Reset (command)
*SRE	Service request enable (command)
*SRE?	Service request enable (query)
*STB?	Read status byte (query)
*TST?	Self-test (query)
*WAI	Wait-to-continue (command)

*CLS, Clear Status command

The command *"*CLS"* resets the status byte and the error queue. The enable, event, ESE and SRE registers are not reset.

*ESE Standard Event Status Enable command

The command *"*ESE <Number> "* sets the contents of the Standard Event Enable register (mask for the event register).

The parameter values here have the following meanings:

Number	Meaning for the Standard Event Enable register
0	Resets the register.
1	(Bit 1) Service Request.

2	(Bit 0) Operation Completed (OPC) is set.
4	(Bit 2) Query Error (QYE) is set.
8	(Bit 3) Device Dependent Error (DDE) is set.
16	(Bit 4) Execution Error (EXE) is set.
32	(Bit 5) Command Error (CME) is set.
64	(Bit 6) User Request (URQ) is set.
128	(Bit 7) Power On (PON) is set.

***ESE? Standard Event Status Enable query**

The command *"*ESE?"* reads-out the mask set in the Standard Events Enable register.

The reply is a decimal value with binary meaning as stated above.

***ESR? Standard Event Status Register query**

The command *"*ESR?"* reads the current contents of the Standard Event Status register. The contents of this register are written directly by the device in response to a certain event. After read-out the contents of this register are reset to 0.

***IDN? Identification query**

The command *"*IDN?"* interrogates the identification designation of the Scanner 2080. Read-out returns a string with the following format:

"PREMA GmbH,2080 SCANNER, 0 , <Year>-<Week>-<Number>"

with	<Year>	=	Year of the software version
	<Week>	=	Week of the software version
	<Number>	=	Number of the software version

Example:

"PREMA GmbH,2080 SCANNER,0,97-10-01"

***OPC 'Operation completed' - command**

The command *"*OPC"* sets the Operation Complete Bit (Bit 0) of the Standard Event Status register after all currently pending command sequences have been executed completely.

***OPC? 'Operation completed' - query**

The command *"*OPC?"* induces the device to write an ASCII 1 into the output buffer when all pending operations have been terminated (completed).

***RST Reset command**

The command *"*RST"* triggers a reset of the Scanner 2080. The device thereby goes to the default (*RST) setting. All still running internal operations are aborted, but no registers are reset.

***SRE Service Request Enable command**

The command *"*SRE <Number>"* sets the mask for the Service Request Enable register. The individual values of the number parameter here have the following meanings:

Decimal value	Function in Service Request Enable register
0	Reset the register.
1	(Bit 0), no significance.
2	(Bit 1), no significance
4	(Bit 2), sets Error Available (EAV).
16	(Bit 4), sets Message Available (MAV).
32	(Bit 5), sets Event Summary Bit (ESB).
128	(Bit 7), sets 'Keypress'

Bits 3 and 6 cannot be used.

***SRE? Service Request Enable query**

The command *"*SRE?"* reads-out the contents of the Service Request Enable register. The bit functions of this register are as in the description given above for the **SRE* command.

***STB? Read Status Byte query**

The query *"*STB?"* read-out the status byte of the Scanner 2080. Because the information is obtainable only in SRQ mode (see 4.7), the command **STB?* returns 0 as reply from the device.

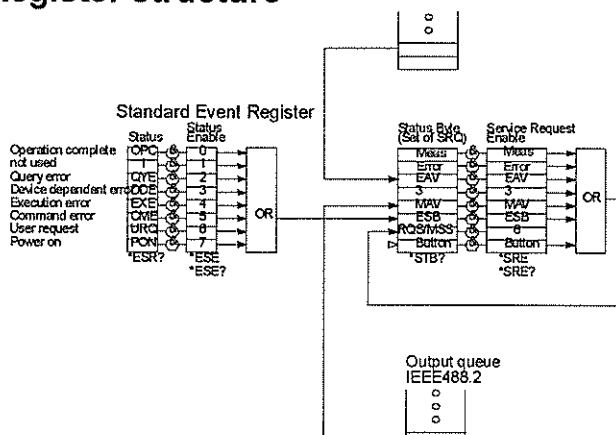
***TST? Self-test query**

The query `"*TST?"` interrogates the result of the self-test of the device which was carried out at power switch-on. The reply `„0“` is returned if the self-test was successful. If any other value is returned, please get in touch with PREMA.

***WAI** Wait-to-Continue command

The command "**WAI*" prevents execution of further commands before the operations of a previous command are completed.

Register structure



4.5 Operation as listener

To prepare the device for receiving commands it must be addressed as LISTENER. The details for this are contained in the manual for the IEEE-488 interface card. After addressing the device, the message „ADR“ is lit in the right window of the main display.

The device understands the following commands:

Mxx Channel selection with
xx = 01,...,80

X1, 2,4 1-pole, 2-pole, 4-pole

D1'text' or D1"text"

Switches-on display mode. A text transmitted following after the „D1“ command is shown in the display of the scanner. The internal display is switched off. The text must be enclosed between quotes.

D0 (D/Null) Switches the display back to normal function.

L0 Short string output (7 characters + terminator)

L1 Long string output (14 characters + terminator)

Q0 (Q/Null) SRQ mode off.

Q1 SRQ mode on for:
- An error message
- Reset

ON, OF Channel connected or disconnected

Ix Contrast adjustment with x = 0 9

RD? READ?, reads-out the current status string

Bxx, Key No. xx was pressed, 00 means 'no keypress'.

Numbering of the keys on the front panel:

	1	2	3	4	5	11	12	13
17	6	7	8	9	10	14	15	16

Scanner 2080	2080 mode
Scanner 2024	2024 mode (previous model)
Commands in 2024 mode:	
CHxy	Switch-on channel (00 - 19)
CH--	Switch-off all channels
D1text	Switch-on text display mode
D0	Switch display back to normal function
L0	4 characters and terminator
L1	35 characters and terminator
Q0	Switch-on SRQ mode
Q1	Switch-off SRQ mode

4.6 Display mode

In display mode the computer can output texts on the display of the device independently of other device functions.

D1 switches-on display mode. The ASCII characters following thereafter are written to the device display as text. All ASCII characters for which a segment code is defined can be displayed. All other characters produce a dark character position. Any additional characters present after D1 and the output text are ignored. If D1 „text“ is issued together with other commands in a character string, D1 „text“ must be the last command in the character string.

D0 switches display mode off again. The display associated with the currently active operating mode and function reappears.

4.7 SRQ mode

If the scanner is not to be interrogated continually by the computer, but shall instead request service from the computer when a status change has taken place, SRQ mode (Service Request) can be switched-on with the command Q1.

A SRQ call will then be issued, for example, when a key is pressed or when error messages appear. Utilisation of SRQ mode requires that the connected computer can recognise a SRQ call and can reply with Serial Poll (consult the computer manual).

Decimal value	Meaning of the SRQ byte
1	(Bit 0), No significance
2	(Bit 1), General error message
4	(Bit 2), Error Queue
16	(Bit 4), Message Queue.
32	(Bit 5), Event Summary Bit (ESB).
64	(Bit 6), Master Summary Status (MSS) / Request Service (RQS)
128	(Bit 7), Keypress

Bit 3 is not assigned.

The corresponding status registers must be interrogated to determine which events have taken place.

For example, if Bit 5 (ESB) is set, the detailed cause can be determined with the query command „*ESR?“.

In the IEEE488 interface, setting of Bit 6 activates the SRQ line so that the controller card in the computer can respond.

4.8 Operating the scanner as TALKER

On request by the computer the device returns a message containing its current status and the most recent measurement reading. For this purpose the device must be addressed as TALKER by the computer. Further details are contained in the manual for the IEEE-488 interface card. After addressing the device as TALKER, the message „ADR“ is lit in the right window of the main display.

The transmitted message consists of a character string and an agreed terminator at the end of each character string according to which the computer recognises the end of the transmission. The message consists of a message unit containing information on the programmed status. The terminator is defined by IEEE488.2 as EOI and LF.

The ASCII (ISO-bit) code is used for the transmission.

The length of the message unit is fixed and always comprises 14 characters + terminator in the long string output or 7 characters + terminator in the short string output.

Description of the transmitted data record

The following table gives an overview of the possible lengths of the data record depending on the selected operating mode.

A data record consists of a message unit followed by a terminator. The message unit is also called status information.

Example: M10X4OFD0Q0B00. (Long string output)
 M10X4OF. (Short string output)

Character positions which are not used are filled with blank characters.

4.9 Error messages

Scanner Mode?	Scanner mode is unsuitable, i.e. select a different measuring configuration (1-, 2- or 4-pole).
---------------	---

5 Technical data

CHANNELS 80 channels 1-pole
40 channels 2-pole
20 channels 4-pole

SWITCHING METHOD bistable floating contact relays

THERMOELECTRIC EMFs .. typically 1 μ V, max 2 μ V after 1.5h warm-up time

**MAX. PERMITTED VOLTAGE BETWEEN
2 CONTACTS** 125 Vp with limitation $10^6 * \text{VHz}$.

**MAX. MEASURING
VOLTAGE** 125Vp (also via the V/ Ω input)
with the limitation $10^6 * \text{VHz}$.

**MAX. INSERTION RESISTANCE
(PER LINE)** approx. 1 Ω

SERVICE LIFE $> 2 * 10^8$ switching cycles (0.1 A, 10 Vdc)

**INSULATION RESISTANCE BETWEEN
2 CONTACTS** 3 G Ω when relative humidity is less than 60%

**INSULATION RESISTANCE WITH RESPECT TO
CABINET** 3 G Ω when relative humidity is less than 60%

STRAY CAPACITANCE less than 100 pF between the contacts

SAFETY complies with EN 61010
The mains ground line is electrically connected to
the cabinet.

WARM-UP TIME 1.5 h until thermoelectric EMF $< 2 \mu\text{V}$

AMBIENT TEMPERATURE
Operation 10°C to 45°C
Storage..... -25°C to 60°C

RELATIVE HUMIDITY

Operation	20% to 75% (0°C to 25°C) 20% to 65% (25°C to 45°C)
Storage	10% to 90% (40°C)
Transport	5% to 95% (40°C) always non-condensing

POWER SUPPLY

Voltage	230V (115V switch-over) 115V +15%, -22% Mains fuse 0.4A delayed
	230V +15%, -22% Mains fuse 0.2A delayed
Power consumption	typically 20 VA / max. 50 VA
Frequency	47 to 63 Hz

WEIGHT approx. 3.4 kg

CABINET half 19-inch cabinet, 2 height units
aluminium pressure casting

DIMENSIONS

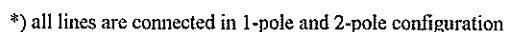
Height	approx. 96 mm (3.8 inch) with feet approx. 89 mm (3.5 inch) without feet (2 height units)
Width	approx. 225 mm (half 19-inch)
Depth	approx. 375 mm

DIMENSIONS OF DELIVERY PACKAGE

Height	approx. 270 mm
Width	approx. 320 mm
Depth	approx. 460 mm

Scanner Input 1

Ground = 41, 42, 43, 44, 45, 50 SHi = Sense Hi
Not connected = 50 SLo = Sense Lo
Output = 46 (Hi), 47 (Lo), 48 (SHi), 49 (SLo) *)

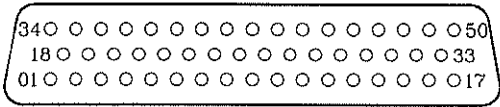


Scanner Input 2

Channel 4-pole	Channel 2-pole	Channel 1-pole	PIN No.	Channel 4-pole	Channel 2-pole	Channel 1-pole	PIN No.
11 SHi	21 Hi	41 Hi	19	16 SHi	31 Hi	61 Hi	25
11 SLo	21 Lo	42 Hi	18	16 SLo	31 Lo	62 Hi	24
11 Hi	22 Hi	43 Hi	35	16 Hi	32 Hi	63 Hi	9
11 Lo	22 Lo	44 Hi	34	16 Lo	32 Lo	64 Hi	8
12 SHi	23 Hi	45 Hi	4	17 SHi	33 Hi	65 Hi	27
12 SLo	23 Lo	46 Hi	3	17 SLo	33 Lo	66 Hi	26
12 Hi	24 Hi	47 Hi	2	17 Hi	34 Hi	67 Hi	11
12 Lo	24 Lo	48 Hi	1	17 Lo	34 Lo	68 Hi	10
13 SHi	25 Hi	49 Hi	21	18 SHi	35 Hi	69 Hi	29
13 SLo	25 Lo	50 Hi	20	18 SLo	35 Lo	70 Hi	28
13 Hi	26 Hi	51 Hi	37	18 Hi	36 Hi	71 Hi	13
13 Lo	26 Lo	52 Hi	36	18 Lo	36 Lo	72 Hi	12
14 SHi	27 Hi	53 Hi	5	19 SHi	37 Hi	73 Hi	31
14 SLo	27 Lo	54 Hi	22	19 SLo	37 Lo	74 Hi	30
14 Hi	28 Hi	55 Hi	39	19 Hi	38 Hi	75 Hi	15
14 Lo	28 Lo	56 Hi	38	19 Lo	38 Lo	76 Hi	14
15 SHi	29 Hi	57 Hi	7	20 SHi	39 Hi	77 Hi	33
15 SLo	29 Lo	58 Hi	6	20 SLo	39 Lo	78 Hi	32
15 Hi	30 Hi	59 Hi	40	20 Hi	40 Hi	79 Hi	17
15 Lo	30 Lo	60 Hi	23	20 Lo	40 Lo	80 Hi	16

Ground = 41, 42, 43, 44, 45, 50
Not connected = 46, 47, 48, 49

SHi= Sense Hi
SLo = Sense Lo



Digital I/O not connected
Cal not connected

5.2 IEEE488 interface

OUTPUT INFORMATION	Channel specification, number of poles, channel open or closed, display status, SRQ on/off, most recently pressed key
INPUT INFORMATION	Channel specification, number of poles, channel open or closed
ADDRESS	assignable from 0 to 30, can be set in the menu „Device, Interface, IEEE488“
SUPPORTED	SH1, AH1, T5, L3, RL1, DC1, DT 1, SR1
SERVICE REQUEST	SRQ after each measurement reading
TERMINATOR	EOI-line and line feed character
KEYBOARD	can be switched-off with REN, can be switched-on with GTL (Go To Local) and with the LOCAL KEY (local lock out with LLO)
COMPATIBILITY	IEEE-488.1 and IEEE-488.2
BUS PLUG CONNECTOR..	24-pole conforming to IEEE-488

PLUG CONNECTOR PINOUT OF IEEE488 INTERFACE

DIO 1	1	13	DIO 5
DIO 2	2	14	DIO 6
DIO 3	3	15	DIO 7
DIO 4	4	16	DIO 8
EOI	5	17	REN
DAV	6	18	GND (DAV)
NRFD	7	19	GND (NRFD)
NDAC	8	20	GND (NDAC)
IFC	9	21	GND (IFC)
SRQ	10	22	GND (SRQ)
ATN	11	23	GND (ATN)
SHLD	12	24	GND

GND = Signalmasse (µP-Masse)

SHLD = Abschirmung

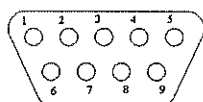
Data bus:		
DIO 1-DIO 8	Data bits 1-8	I/O
Transfer control bus		
DAV	Data valid	I/O
NRFD	Not ready for data	I/O
NDAC	No data accepted	I/O
Interface control bus		
IFC	Interface clear	I
ATN	Attention	I
SRQ	Service request	O
REN	Remote enable	I
EOI	End or identify	I/O

Attention! Avoid static discharges via the IEEE488 plug connector (ESD protection).

5.3 Serial data communication interface RS232

DATA FORMAT	8N1 8 data bits, no parity, 1 stop bit
BAUD RATE	9600 Bd
HANDSHAKE	optionally: - Xon / Xoff - RTS / CTS - no handshake
PLUG CONNECTOR TYPE	9-pole sub-D female connector

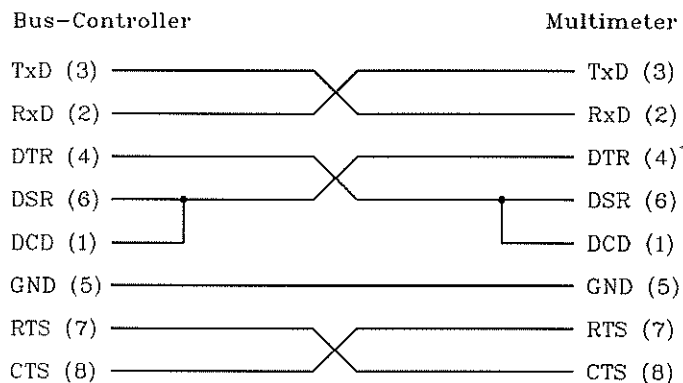
PLUG CONNECTOR PINOUT



PIN No.	Direction	Signal	Description
1	Input	DCD (Data Carrier Detect)	
2	Input	RD (Receive Data)	Received data
3	Output	TD (Transmit Data)	Transmitted data
4	Output	DTR (Data Terminal Ready)	
5		GND	Signal ground
6	Input	DSR (Data Set Ready)	
7	Output	RTS (Request to Send)	
8	Input	CTS (Clear to Send)	
9	Input	RI (Ring Indicator)	

Table: RS232 plug connector pinout

RS232 cable plug connector pinout



5.4 EC conformity

The PREMA conformity declaration for the Scanner 2080 certifies fulfilment of the protection requirements defined in the directive of the council of the community for harmonising the statutory stipulations with regard to electromagnetic compatibility (89/336/EEC) and the low voltage equipment directive (73/23/EEC).
Conformity of the Scanner 2080 is ensured.

Electromagnetic compatibility (EMC)

The EMC measurements described below have been carried out and compliance with the limiting values has been verified and recorded in the documentation, for certification of compliance with the protection requirements according to the EMC directive 89/336/EEC.

EMC measurement of parasitic radiation

EN 50081-1

Special basic standard for parasitic radiation, Part 1

Domestic area, business and trading area, small factories

EN 55011

Class B, limiting values and measuring procedures for radio interference produced by industrial, scientific and medical high frequency apparatus (ISM appliances). EMC basic standard.

Parasitic RF radiation in the frequency range from 30 MHz to 1 GHz.

EN 55011

Class B, limiting values and measuring procedures for radio interference produced by industrial, scientific and medical high frequency apparatus (ISM appliances). EMC basic standard.

Parasitic mains-wiring borne interference in the frequency range from 150 kHz to 30 MHz.

EMC measurement of immunity with respect to disturbance

According to EN 50082-1, special basic standard for disturbance immunity, Part 1. Domestic area, business and trading area, small factories.

Supplement to the specification under EMC test conditions.

ENV 50140

EMC disturbance immunity with respect to high frequency electromagnetic fields.

EMC basic standard / 30-1000 MHz, disturbance environment: Domestic area.

Incident radiation: 3 V/m, 80% AM - e.g. Handy at 3-5m distance.

ENV 50141

EMC disturbance immunity with respect to line-borne disturbance parameters induced by high frequency fields. EMC basic standard / 150 kHz - 80 MHz.

Incident radiation: 3 V_{rms} on open lines.

EN 61000-4-2

EMC Part 4: Testing and measuring procedures,

main section 2: Testing the immunity with respect to ESD.

ESD: Air/contact discharge +/-8 kV / 4 kV - protection class 2.

EN 61000-4-4

EMC Part 4: Testing and measuring procedures,

main section 4: Testing the immunity against burst interference.

Disturbance environment: Industrial area 2kV_{pp} - protection class 3.

prEN 61000-4-5

EMC Part 4: Testing and measuring procedures,
main section 5: Testing the immunity against surge interference.
Disturbance environment: Industrial area 2kV asymm. - protection class 3.

User safety:

The safety requirements according to the low voltage equipment directive 73/23/ECC
have been fulfilled (product standard EN 61010).

6 Accessories

6.1 Adapter card (Option 3110)

This adapter card permits screw terminal connection of the measuring lines and is plugged externally onto the 50-pole subminiature-D plug connector of the Scanner 2080.

Two such adapter cards are required for connecting all channels (20 x 4-pole, 40 x 2-pole or 80 x 1-pole).

Max. voltage: 40V

Dimensions: approx. 70 mm x 110 mm

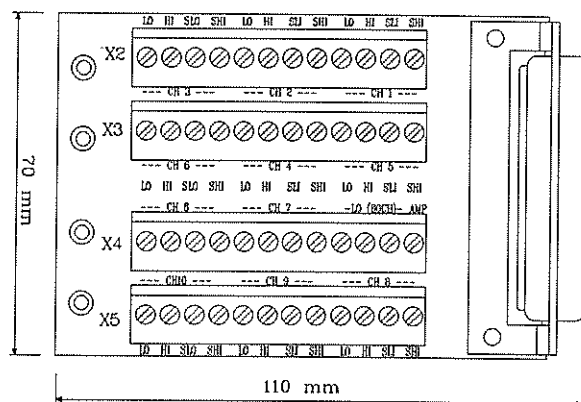


Fig.: Adapter card for scanner inputs

Note: Only voltages not exceeding 40 V with respect to ground may be connected via this adapter card because the screw terminals are not protected against human contact with high voltages.

6.2 Mating plug / Sub-D (6000/03)

A 50-pole subminiature-D plug connector can be used for connecting 40 lines to the Scanner 2080. This plug connector has soldered connections and a cable output for round cables with diameters up to 12 mm.

Two such plug connectors are required for connecting all channels.

6.3 Current shunt (3017)

Current shunt up to 10A, resolution 10mV/A; DC accuracy 0.1%

6.4 RS232 cables (3018)

RS232 data communication cable for controlling the instruments via the RS232 serial data communication port of a PC.

Null modem cable with crossover of the RTS/CTS and SD/RD lines.

6.5 Protective carrying bag (4100)

Flexible protective carrying bag for the Scanner 2080 and various accessories with cleat closure and shoulder strap.

Dimensions in cm : 27 x 39 x 15 (W x H x D)

6.6 IEEE488 bus interface accessories

Control of the measuring instrument via the IEEE bus requires an IEEE488 interface card in the computer.

Two types of IEEE488 interface cards are available from PREMA for PC XT/AT and compatible computers:

- 5024 IEEE488 interface card GPIB1000 for PC XT/AT including driver software in Basic, C, Turbo Pascal, Assembler and QuickBasic.
- 5025 IEEE488 interface card PC2A for PC XT/AT including driver software in C, Basic, QuickBasic, VisualBasic. Further software on inquiry.

5023K IEEE488 interface cable with back-mounting plug connector, shielded, length: 2m. .

6.7 19-inch rack-mounting kit (5021 G)

Complete rack-mounting slide-unit kit for mounting a Scanner 2080 in a 19-inch equipment rack.

2 height units. The rack-mounting kit is supplied complete with all required screws. The scope of delivery also includes a blind panel for use if only one Scanner 2080 is fitted.

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