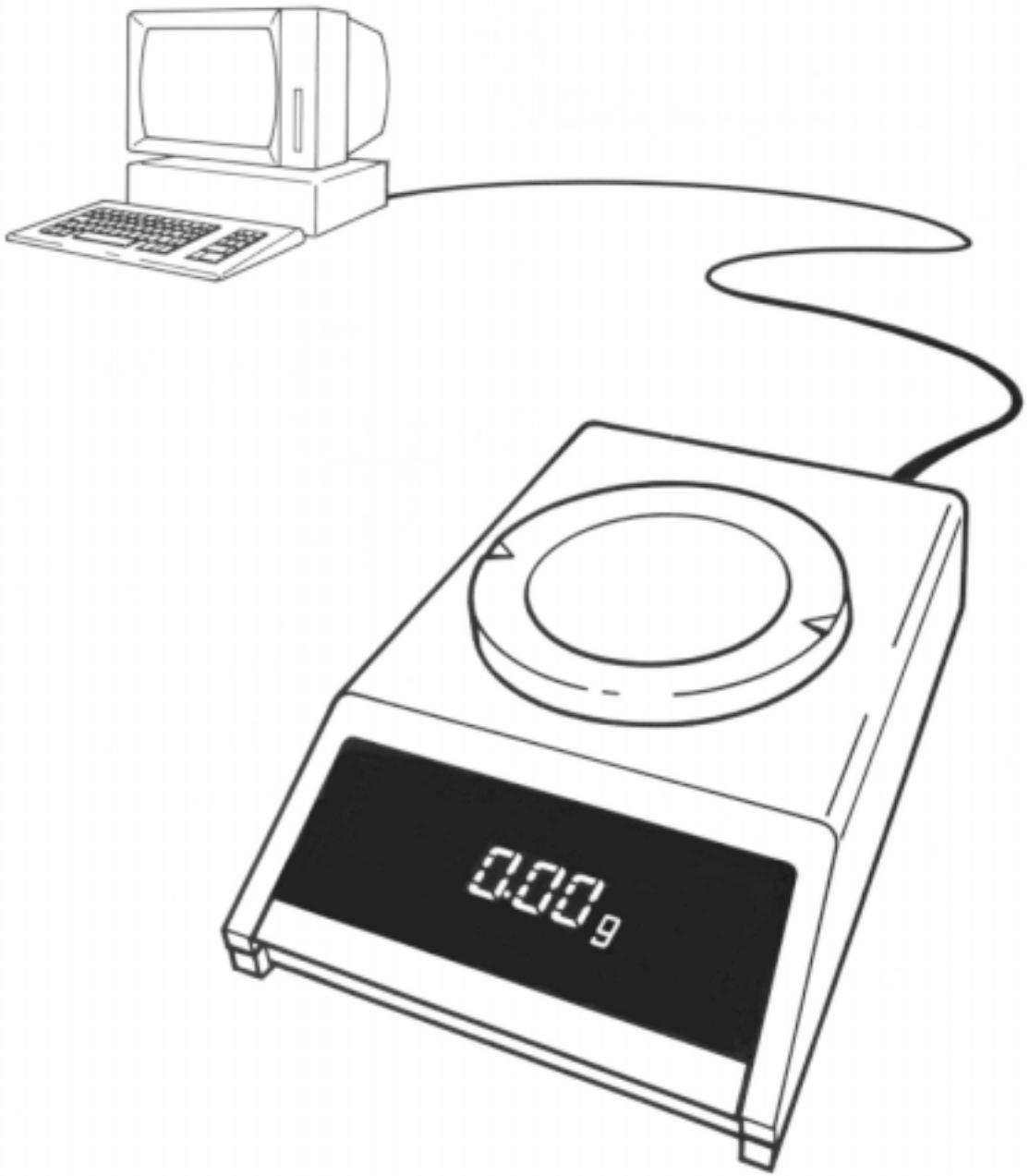
Operating instructions

METTLER TOLEDO
Bidirectional
Data Interface
for the J series balances

Option 018



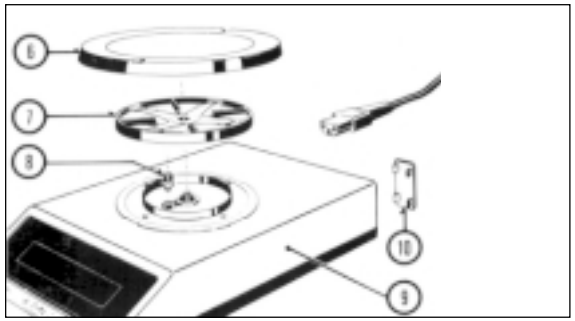
METTLER TOLEDO

Bidirectional Data Interface (CL/RS232C) for the J series balances, Option 018

METTLER TOLEDO J series balances can be equipped with a bidirectional interface, Option 018. With a 20 mA current loop or RS232C the J series balance can transfer the results to a data receiver (computer, terminal, printer, etc.). The balance can also receive instructions, and carry them out (full duplex operation). The J series balance can thus be integrated into a controlled weighing system.

In bidirectional operation the following functions are available:

– automatic transfer of measured results
– taring and pre-taring
– conversation of the weighed result (scaling)
– operation of balance display



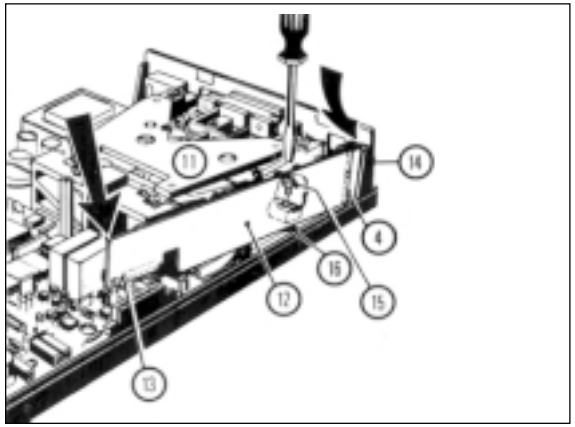
The mount the board

Warning: Power cable must be disconnected!

Open balance

- Take off pan (6) and pan support (7). Undo screw (8).
- Lift off upper housing (9) vertically upwards.
- Remove plastic cap (10) at back of balance (push out towards rear).

Caution: Do not touch measuring cell (11)!



Instert board

- Fit board (12) as illustrated, connect connector (13).
- Fit screw (15) in hole (16) and tighten.

Close housing (see upper illustration)

- Carefully lower upper housing on to the balance.
- Insert screw (8) and tighten moderately.
- Put on pan support and pan, connect power cable.

To configure the interface parameters (I-Face)

Once the interface board is in place, the interface parameters shown alongside can be selected.

Procedure:

– Switch off balance. → Standby — Display blank.

– Press control bar and keep pressed until — `------` → `-ConF-` appears.

– Release control bar. — `rESEt` appears.

To set standard parameters:

– Press control bar and keep pressed until — `YES` → `-End-` → `d 8.8.8.8.8.8 g` appears.

For other settings:

– After briefly press control bar. — `rESEt` → `I-FACE` appears (interface).

– Hold control bar down until the first parameter appears.

– To accept displayed parameters → Press control bar until the next one appears.

– To change parameter → Briefly press control bar.

Data transmission mode (see "Data output"):

`S. Stb`	stable single values
`S. ALL`	current single values (stable or not)
`S. Auto`	stable single value after each change of weight
`S. Cont`	all values, continuous

Transmission speed (baud rate):

`b 110`	110 baud
`b 2400`	2400 baud
`b 9600`	9600 baud

Parity:

`P -E-`	Even
`P -O-`	Odd
`P -M-`	Mark
`P -S-`	Space

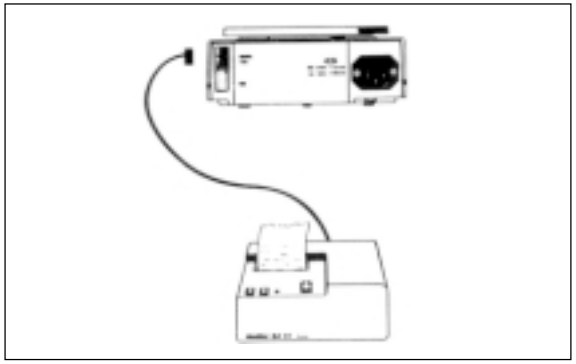
Interval between data lines and handshake:

`PSE 0.0`	for fast data receivers (computers, etc.)
`PSE HS`	use handshake line
`PSE 1.0`	for slow data receivers (printers, etc.)
`PSE 2.0`	for slow data receivers (printers, etc.)

Print command (to start data transmission):

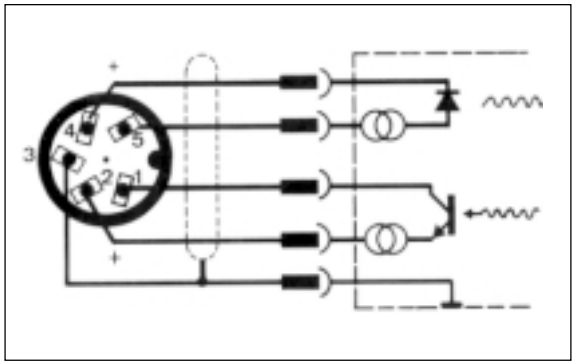
`PrtoFF`	No start with balance control bar
`Prt on`	Start with balance control bar
`-End-`	Hold control bar down till display confirms.

Connection of instruments with current loop interface



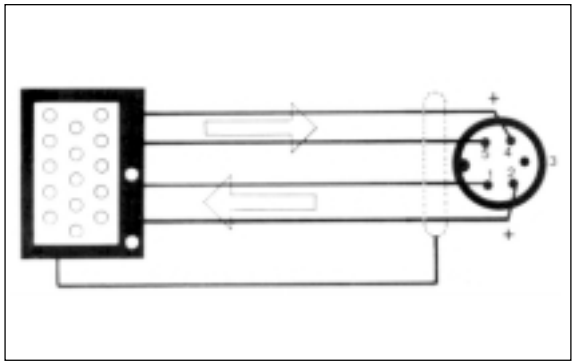
The METTLER TOLEDO GA44 printer can (in standard configuration) be connected immediately to the J series balance. The cable for this is included with the printer (to re-order: Order No. 47926).

For other instruments, the cable has to be ordered separately:
Order No. 47936.



The cable 47936 is connected as shown in the adjoining figure.

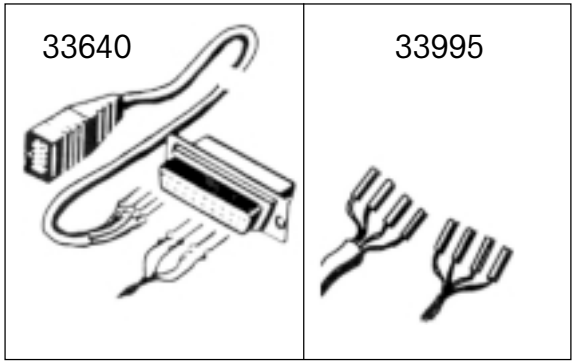
It can be used directly for connecting to METTLER TOLEDO CL instruments.



If non-METTLER TOLEDO instruments with a current loop interface are connected to a J series balance, the non-METTLER TOLEDO instruments must provide the power. In this case the limit figures must be ovserved. They are described in the section "Interfaces".

The wiring diagram here shows how to connect the cable for a non-METTLER TOLEDO instrument with current loop interfaces.

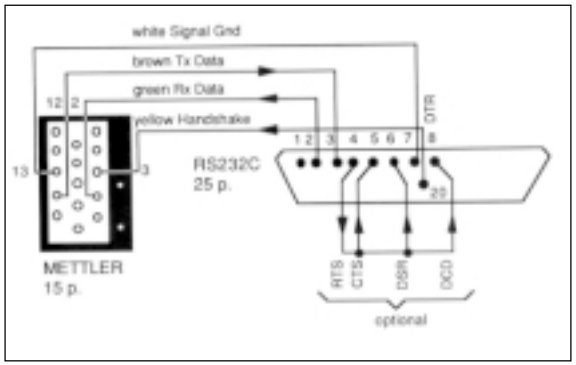
Connection of instruments with RS232C interface



The cable for instruments with an RS232C interface has to be ordered separately:
Order No. 33640 (male) or 33995 (female)
Made-up cables are obtainable for the following instruments:

Printer EPSON	P-40	Order No.	33688
Computer EPSON	PX-4		33982
	HX-20		33955

Depending on whether the instrument in question is data terminal equipment (DTE) or data communication equipment (DCE), this cable is connected as follows:



Connections for Data Terminal Equipment:

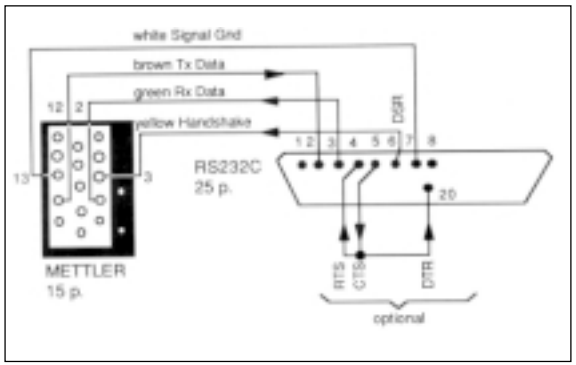
Pin 2: green wire (data input to balance)

Pin 3: brown wire (data output from balance)

Pin 7: white wire (signal ground)

Pin 4 or 20: yellow wire (handshake)

in addition, if required by non-METTLER TOLEDO instrument:
hard-wire free handshake terminal (pin 4 or 20)
to pins 5 (CTS), 6 (DSR) and 8 (DCD).



Connections for Data Communications Equipment:

Pin 2: brown wire (data output from balance)

Pin 3: green wire (data input to balance)

Pin 7: white wire (signal ground)

Pin 5 or 6: yellow wire (handshake)

in addition, if required by non-METTLER TOLEDO instrument:
permanently connect free handshake terminal pin 5 (CTS) to pin 4 (RTS) or pin 20 (DTR), or permanently connect pin 6 (DSR) to pin 4 (RTS) or to pin 20 (DTR).

Description of interfaces

The METTLER TOLEDO J series balances has an RS232C voltage-controlled interface and a passive 20 mA current loop (CL) interface.
These interfaces can be operated in one direction (simplex) or in both directions (full duplex).

With both interfaces, the data outputs operate in parallel. However, only one of the inputs can be used at any on time.

The command input is active as soon as the display is switched on. The data outputs are inactive until the start-up routine has been completed.

Principle of transmission: bit serial, asynchronous (1 start bit)
7-bit code ASCII-ISO646 + parity bit
1 stop bit (receive), 2 stop bits (transmit)

If in bidirectional mode the interface is interrupted for the time of 10 consecutive characters, this creates a BREAK condition, i.e. all commands initiated via the interface (transmission mode, pre-tare, text readout, etc.) are Reset. The balance continues to operate the way it was configured.

How to configure the interface parameters is described in Section "Preparation".

Operating modes:

- Free mode operation
- Handshake mode operation
  For software handshake, see Technical Information Bulletin (TIB): "The METTLER TOLEDO CL Interface". For order no., see introduction to "The METTLER TOLEDO CL Interface"

Data loss can be prevented in the following ways, without the need for extra handshake lines:

1. With "Software Handshake"
2. With an adjustable interval of up to 2 seconds between data strings.
3. By selective request of results with instruction SI $C_R L_F$. If the balance cannot produce a valid result, it immediately sends "SI". The control computer then knows that it has to ask again for a measurement.

These operating modes can also be used with the RS232C interface. The hardware handshake described below can be used as well.

Hardware handshake RS232C

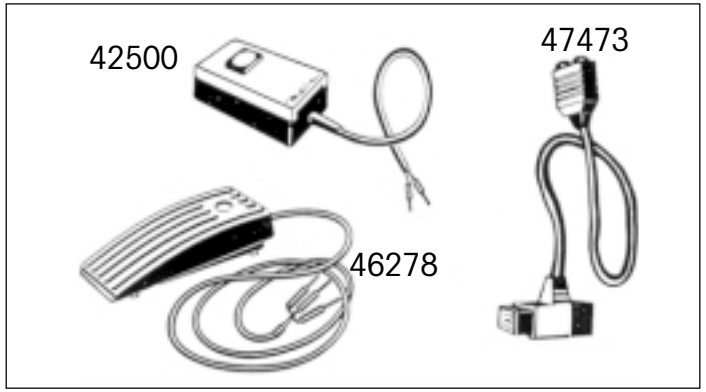
With the aid of a separate signal line the J series balance can be "slowed down" when transmitting values via the RS232C interface, i.e. the balance sends data only when the connected instrument is ready to receive. For this the connected instrument must support handshake mode, and suitable wiring must be used (see "Preparation").

The signal is processed if "PSE HS" has been configured and when the line is properly connected.

The balance transmits when the handshake line carries a positive voltage or when it is open. It does not transmit if the voltage is negative. If the level changes from positive to negative during transmission, a maximum of 2 more characters are sent.

If this handshake function is used, the transfer function on the right must not be employed. It is still possible to start data transmission with the control bar on the balance (configuration: Prt on → Menu: Print).

Transfer function with additional key



Data transmission can be started with a manual or foot-operated switch. An adaptor is required in this case (order No. 47473).

Manual switch	Order No.	42500
Foot switch		46278

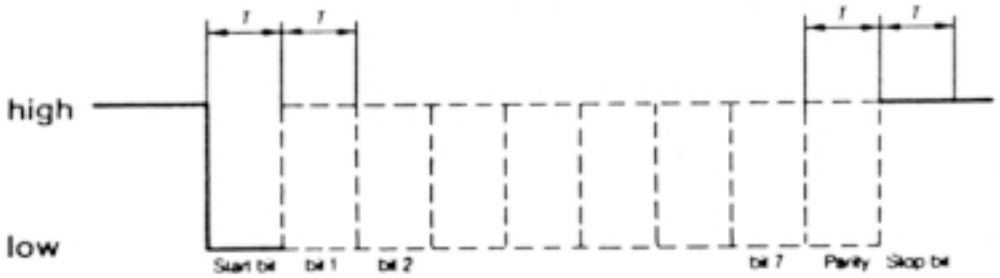
If transfer is started in this way (or with the PRT key on the GA44 Printer), the handshake function described on the left cannot be used.

More on the initiation of data transmission is to be found in the section "Data Retrieval".

METTLER TOLEDO CL interface

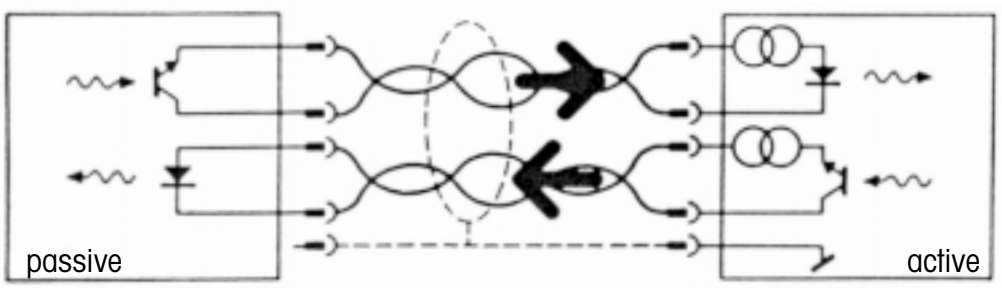
Technical data:

20 mA current loop interface,
full duplex
2 separate data loops
bit serial, asynchronous (1 start bit)
7-bit code (ASCII, ISO-646) + parity bit
inactive state - high level current 20 mA.



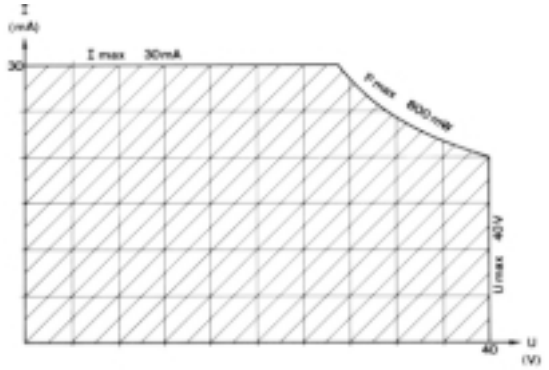
Interruption of the loop for time T starts character transfer. Transfer of the single character is terminated by closing the loop again for at least time T.

The CL interface of the balance has two passive loops, independent of each other.



Balance Computer

The passive current loops of the balance therefore require external power sources. To avoid damage to the CL interface by these external power sources, the following limits must be strictly observed:



The U/I characteristic of the source must lie within the hatched area. To ensure interference-free transmission, the following conditions must also be satisfied:

- Voltage step of source 15 V (+10 %/ -0 %)
- Current (high) between 18 mA and 24 mA
- Current rate of rise 2…20 mA/µs
- Cable: screened, twisted pairs, approx. 125 Ω/km,
  wire dia. (each) 0,14 mm², approx. 130 nF/km,
  length: 300 bd 1000 m
  2400 bd 500 m

For further information on the METTLER TOLEDO CL interface (hardware and software aspects), see Technical Information Bulletin (TIB) "The METTLER TOLEDO CL Interface".

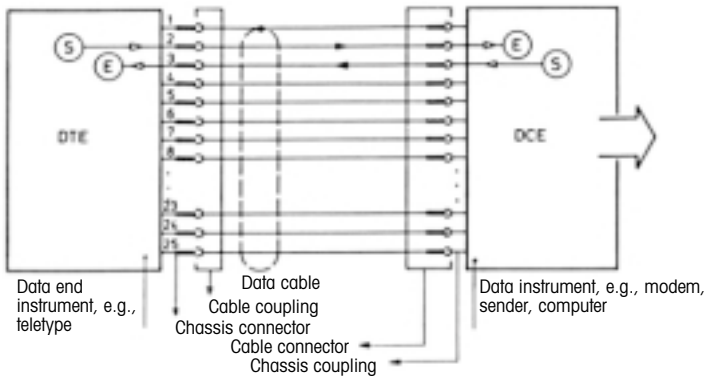
Order No. 720106 German 720107 English
720108 French 720109 Spanish

The RS232C Interface

Voltage-controlled interface to standards EIA RS-232-C, DIN 66020
These standards correspond in substance to CCITT recommendations V.24 and V.28.

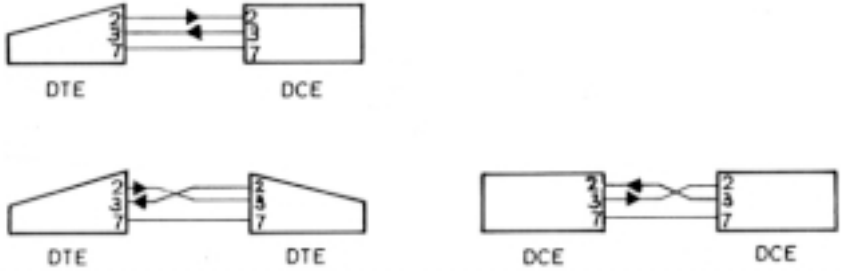
A distinction is made between two kinds of equipment:
- DATA TERMINAL EQUIPMENT (DTE), e.g. teletype, printer
- DATA COMMUNICATIONS EQUIPMENT, e.g. modem, transmitter

The RS232C interface was originally designed to link data terminal equipment with data communications equipment. The lines and signals are arranged for this original configuration, which is still in use today.



- A DTE transmits its data at terminal 2 (data direction DTE → DCE)
- A DCE transmits its data at terminal 3 (data direction DCE → DTE)

For short distances, where data communications circuits would be pointless, the RS232C interface can also be used for two instruments, i.e. the combinations DTE - DTE and DCE - lines can be omitted. A minimum configuration can be achieved with two (unidirectional operation) or three lines (bidirectional operation).



In addition to the interface circuits mentioned above, the most common handshake lines are given below.

DTE			DCE
1 Protective Ground			1
2 Transmit Data	TxD	→	2
3 Receive Data	RxD	←	3
4 Request to Send	RTS	→	4
5 Clear to Send	CTS	←	5
6 Data Set Ready	DSR	←	6
7 Signal Ground			7
8 Data Carrier Detect	DCD	←	8
20 Data Terminal Ready	DTR	→	20

Initiation of data transmission

At any moment the balance has available an instantaneous weighing result which can be stable or unstable, and either valid or invalid. All four combinations are possible.

Depending on the application, data transmission can be initiated in the following ways:

- Control bar of the balance (configuration: "Prt on", Menu: "Print")
- external print key (Transfer key or "PRT" key on GA44)
- Automatic operation (configuration: "S. Auto"; "S. Cont")
- Commands via the interface (Send commands)
- Loading or unloading the balance (Send commands "SR"; "SNR")

The standard setting for data transmission is:

S. Stb — A single, stable value is transmitted when data transfer is started with a key.

The transmission mode can be altered in the configuration register (I-Face):

S.All — A single, instantaneous value (stable or not stable) is transmitted when data transfer is started with a key.

S. Auto — A stable value is transmitted automatically after each change of weight (threshold 1 g or 5 g in the case of gram balances).

S. Cont — All values are transmitted automatically in time with the configured interval (unstable values with "SD", stable values with "S" in the identification block), see data format of valid result.

In bidirectional operation, these transfer modes can be selected via the interface with Send commands (described in section "Instruction Set"), regardless of which transfer mode has been configured.

Transfer mode	Corresponding Send command
S. Stb *	S
S. All *	SI
S. Auto	SNR
S. Cont	SIR

* Start transfer with key

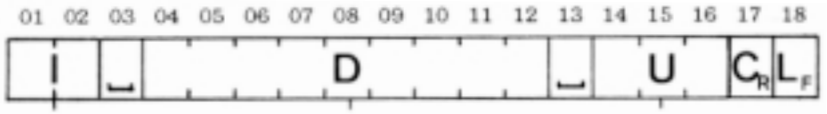
Should the interface link be broken (BREAK) the transfer mode is lost if it was selected via the interface. The configured transfer mode remains intact, however, until another one is configured.

Note: The standard setting for the interval between data strings is 1 second (for GA44 Printer).
When operating with a computer, this interval is too long. In most cases, therefore, it is configured as the minimum (0.0).

Valid result

Each valid weighing result is available in uniform format at the data output. The data string (series of characters) can be divided into three blocks. It is always terminated with Carriage Return (C_R) and Line Feed (L_F).

␣ = Space



Identification block Data block Unit block

Characters

1	Transfer mode	␣ started with Transfer or Print key S started with Send commands or balance in "Send Continuous" mode ("S. Cont")
2	Stable state	␣ stable result D unstable result (dynamic)
4…12	Weighing result	9 characters Result aligned to the right, including sign "-" directly ahead of first numeral, decimal point; leading zeros are replaced by spaces. With DeltaDisplay or outside the DeltaRange the last digit is shown as a space.
14…16	Weight unit	0…3 characters, terminated immediately with C_RL_F: g, %, PCS, Stk, vacant

Example:

SD␣ ␣ ␣ -24.375␣ gC_RL_F

Invalid result

Under abnormal operating conditions (e.g. during overload, underload, error message, etc.) the balance cannot produce a valid weighing result.
The balance responds accordingly, depending on how data transfer is started:

Balance configuration S. All or S. Cont, data transfer started with key (Print, PRT, Transfer):

␣I C_RL_F	invalid result
␣I+ C_RL_F	overload
␣I- C_RL_F	underload

Data transfer started with commands S, SI, SIR or balance in transfer mode S. Cont:

␣I C_RL_F	invalid result
␣I+ C_RL_F	overload
␣I- C_RL_F	underload

The messages stated above occur immediately after transmission is started. In all other cases the balance waits until it can provide a valid result.

Special messages from balance

TA C_RL_F in bidirectional operation, taring was done with the key (acknowledgement)

STANDARD␣␣V20.31.00 Switch-on message, software version

ET C_RL_F
ES C_RL_F
EL C_RL_F

} Error messages in bidirectional operation (→ "Appendix")

General information on instruction set

J series balances with Option 018 are equipped with full duplex interfaces, i.e. they can not only transmit weighing results, but also receive, process and execute certain control instructions.
These instructions are described in this section.

A distinction is made between upper and lower case letters.

Each instruction must be terminated with the characters CARRIAGE RETURN (C_R) and LINE FEED (L_F).

An instruction without its related parameters normally resets the function in question.

Instructions which have not yet been executed are overwritten by newly received instructions, i.e. they are lost.

A BREAK condition (see section "Interfaces") erases all instructions and the balance then behaves as if it had been switched off and on again.

If the balance does not receive an instruction correctly, or cannot process or execute it, it emits the appropriate error message (see section "Appendix").

Note: Simple specimen programs for bidirectional operation with the J series balance are given at the end of this section.

The following symbols are used in this section:

␣	Space
: =	Definition
< >	Parameter
[ ]	Optional

Instruction: **S** (Send value)

Format: S C$_R$L$_F$

Function: Causes the balance to send the next available stable result:
- if stable, the value at that moment
- if unstable, the next stable value.

Note: In the case of overload/underload, SI+/SI- is sent immediately.
This instruction can also be used to cancel other Send instructions.

Example:

Computer		Balance
S C$_R$L$_F$	→	
		Stable
	←	S␣␣␣␣␣100.00␣gC$_R$L$_F$
		or with overload
	←	SI+C$_R$L$_F$
		or with underload
	←	SI-C$_R$L$_F$

Instruction: **SI** (Send Immediate value)

Format: SI C$_R$L$_F$

Function: On receiving this instruction, the balance transmits the current result, regardless of whether it is stable or not. The measured value is marked according to status (see Section "Data Retrieval").

Example:

Computer		Balance
SI C$_R$L$_F$	→	
	←	SD␣␣␣␣98.54␣gC$_R$L$_F$
		or if stable
	←	S␣␣␣␣100.00␣gC$_R$L$_F$
		or if invalid
	←	SI C$_R$L$_F$
		or with overload
	←	SI+C$_R$L$_F$
		or with underload
	←	SI-C$_R$L$_F$

Instruction: **SR** (Send value and Repeat)

Format: SR C$_R$L$_F$

Function: Causes the balance to send the next available stable result, and then with each weighing to send automatically two additional results, namely an unstable, valid result in the event of significant deflection, followed by the first stable result.

Note: Significant deflection is taken to be:
± 12,5 % of the last stable value (relative threshold) or at least 30d*.

This automatic transfer mode remains in effect until the balance receives some other Send instruction, or until the interface is interrupted (BREAK).

Example:

Computer		Balance
SR C$_R$L$_F$	→	
		Stable
	←	S␣␣␣␣100.00␣gC$_R$L$_F$
		Deflection
	←	SD␣␣␣115.78␣gC$_R$L$_F$
		Stable
	←	S␣␣␣␣150.00␣gC$_R$L$_F$
		etc.

Format: SR␣<Threshold>C$_R$L$_F$

Function: Causes the balance to send the next available stable result, and then with each weighing to send automatically two additional results, namely an unstable, valid result in the event of significant deflection, followed by the first stable result.

Note: <Threshold>: = Threshold value in absolute terms from the last transmitted value, in weight unit g. Numerical value at least 3d*.

This automatic transfer mode remains in effect until the balance receives some other Send instruction, or until the interface is interrupted (BREAK).

Example: as shown on left, with absolute threshold.

This absolute threshold is recommended particularly with automatic additive weighing operations, as with SR C$_R$L$_F$ the relative threshold would also become greater with increasing total weight.

* d = digit = smallest step displayed

Instruction: **SNR** (Send Next value and Repeat)

Format: SNR C_RL_F

Function: Causes the balance to send the next stable result and, after each loading and unloading, to send automatically an additional stable result (threshold 1 g or 5 g with gram balances).

Note: In contrast to the SR instruction, no dynamic values are transmitted.
This automatic transfer mode remains in effect until the balance receives some other Send instruction, or until the interface is interrupted (BREAK).

Example:

Computer		Balance
SNR C_RL_F	→	
		Stable
	←	S␣␣␣␣␣100.00␣gC_RL_F
		Deflection min. 1 g
		Stable
	←	S␣␣␣␣␣150.00␣gC_RL_F
		etc.

Instruction: **SIR** (Send Immediate value and Repeat)

Format: SIR C_RL_F

Function: The balance transmits the instantaneous result in any case, and then automatically all other results at the same speed as the balance display (i.e. approx. every 0.16 seconds).

Note: Especially suitable for dynamic weighing. Owing to the large volume of data from the balance (1 measurement every 0.16 seconds) the baud rate must be set high enough not to lose any data.
If a Print interval of 0.0 has not been configured, the transmission rate is the same as the interval (1 or 2 seconds). Intermediate values are lost.
This automatic transfer mode remains in effect until the balance receives some other Send instruction, or until the interface is interrupted (BREAK).

Example:

Computer		Balance
SIR C_RL_F	→	
	←	SD␣␣␣␣98.54␣gC_RL_F
	←	SD␣␣␣␣95.76␣gC_RL_F
	←	SD␣␣␣␣95.32␣gC_RL_F
	←	S␣␣␣␣␣95.40␣gC_RL_F
		etc.

Instruction: T (Tare)

Format: T C$_R$L$_F$

Function: With this instruction the balance can be tared via the interface.

Note: In the stable condition, taring is immediate.
In an unstable condition, the instruction is stored until stability is reached, then taring takes place. During this time an instruction SI or SIR would cause "SI" to be sent. The error message "EL" follows if stability is not achieved in about 10 s.

Taring is not possible in the event of overload or under load. The error message "EL" is given immediately.

If the balance shows -OFF- after a power failure, it can be started again with this instruction.

Example:

Computer		Balance
T C$_R$L$_F$	→	
		Unstable
		Display:

		Wait
		Stable Display:
		0.00 g

Instruction: B (Base)

Format: B [␣<Offset>] C$_R$L$_F$

Function: On receiving this instruction the balance consistently subtracts the <Offset> value from all weighing results (pre-taring).

Note: <Offset>: = Numerical value, max. 7 significant digits, sign and decimal point optional.

<Offset> is in grams (g).
The value must be within the permitted weighing range, i.e. <Offset> + tare weight = 0 - maximum load.

<Offset> is rounded to the balance's resolution before the results are processed.

B has the same effect as B␣0, i.e. it cancels an Offset instruction. Taring has the same effect.

Example:

Computer		Balance
		Display: 0.00 g ↓
B␣100C$_R$L$_F$	→	Display -100.00 g
S C$_R$L$_F$	→	↓ Stable
	←	S␣␣␣-100.00␣gC$_R$L$_F$

Instruction: **U** (Unit)

Format: U [<Dec>]␣<Factor>[␣<Name>[␣<Step>]]C_RL_F
U C_RL_F

Function: Defines a unit with user-selected factor (scaling). Display no longer shows "g".

Note:

<Dec>: = Number of decimal places; number is reduced if greater than resolution.

<Factor>: = Divisor, by which all weighing results are divided.
Positive value, at least 1 digit (display step)

<Name>: =
- #, PCS for transmitting "PCS"
- STK, Stk for transmitting "Stk"
- % for transmitting "%"

<Step>: = Display step in digits:
1, 2, 5, 10, 20, 50, 100

<Dec>, <Name> and <Step> are optional.
Without entering <Dec>, the converted vallues are shown with the maximum number of decimal places permitted by the balance. If <Name> is not entered, no unit is displayed.

The factor selected is valid for the displayed values and the values at the data output until another factor is chosen, U C_RL_F is transmitted or the interface is interrupted (BREAK).
Then "g" appears again.

Example: see the end of this section.

Instruction: **ID**

Format: ID C_RL_F

Function: Causes the balance to transmit its identification (3 lines).

Note: The balance transmits:

<Software Version>
TYPE: <Balance type>
INR: <Identification number>

Instruction: **D** (Display)

Format: D␣<Text> CRLF

Function: This instruction enables a short text to be displayed. The balance continues working normally. The execution of Send instructions is not affected.

Note: <Text>: = all printable characters of the ISO 646 Code Table.
The only restriction is the limited capacity of the 7-segment display (see Table on right)

<Text> is displayed aligned to the left.
If <Text> is longer than the balance display can show, the text entered first will not appear.

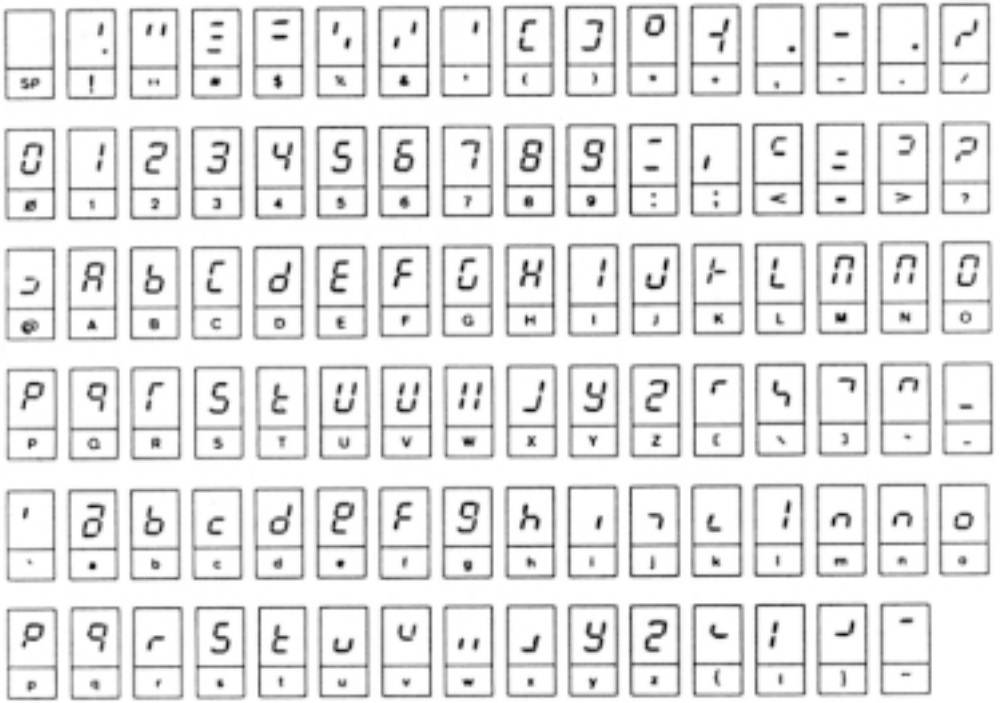
Caution: D␣CRLF blanks the 7-segment display.
D CRLF resets the display for showing measurements.

Example:

Computer		Balance
		Display 100.00 g
D␣TEST CRLF	⟶	tESt

7-segment presentation of text characters

The 95 characters of the ISO 646 Code Table printable with a 7-segment display are shown in the following table.



Terminal programs for control computers

The programs listed below enable the computer to work as a simple terminal, so allowing a direct dialog with the balance.

Interface parameters (standard setting of J series balance):
2400 baud, even parity, 7 data bits and 1 stop bit

Caution: The punctuation must be strictly adhered to when entering data.

Terminal program for IBM-PC

```
10 Open "com1:2400,E,7,1,CS,CD,DS,RS,LF" AS #1
20 IF LOC(1)>0 THEN PRINT INPUT$(LOC(1),#1);
30 K$=INKEY$ : IF K$<>"" THEN PRINT#1,K$; : PRINT K$;
50 GOTO 20
```

Terminal program for Epson HX-20

```
10 TITLE "TERM"
20 WIDTH20,4
30 OPEN"O",#1,"COM0 : (57E1F)"
40 OPEN"I",#2,"COM0 : (57E1F)"
50 IF LOF (2))0 THEN PRINT INPUT$(LOP(2),#2);
60 K$=INKEY$:IFK$<>""PRINT#1,KS;:PRINTK$;
70 IF K$=CHR$(13)THEN K$=CHR$(10):PRINT#1,K$;:PRINTK$;
80 GOTO 50
```

Terminal program for Epson PX-4

```
10 OPEN "O",#1,"COM0:(C7E1F)"
20 OPEN "I",#2,"COM0:(C7E1F)"
30 IF LOC (2)>0 THEN PRINT INPUT$(LOC(2),#2);
40 K$=INKEY$ : IF K$<>""THEN PRINT#1,KS;:PRINT K$;
50 IF K$=CHR$(13) THEN K$=CHR$(10) : PRINT#1,K$; : PRINT K$;
60 GOTO 30
```

Example of program for bidirectional communication

Task: Checking of packages containing small parts

Weight o package (tare)	51.50 g
Weight of each part	1.58 g
Number of parts per package	100 Stk.

Program in BASIC for Epson PX-4

```
10 OPEN "I",#1,"COM0:(C7E1F)"
20 OPEN "O",#2,"COM0:(C7E1F)"
30 PRINT#2,"B 51.5"
40 PRINT#2,"U0 1.58 PCS 1"
60 PRINT#2,"SR" : CLS
70 INPUT#1,X$ : PRINT X$
80 GOTO 70
90 END
```

Users of Epson HX-20 please note:

Only the interface parameter for baud rate (lines 10 and 20) has to be altered:

Change "COM0:(C7E1F)" to "COM0:(57E1F)"

What's gone wrong if …?

When trouble-shooting, consult also the operating instructions for the balance.

… one of the following error messages is transmitted via the interface?	
ES	An instruction that has been received is wrong (Syntax Error); the required form of the instruction has not been observed.
EL	An instruction that has been received is wrong in content (Logistical Error). The syntax may be correct, but for some reason it cannot be executed. Example: Tare instruction given with balance overloaded or underloaded.
ET	A character sequence has not been correctly received (Transmission Error): Probably the transmission parameters of computer and balance interface do not match.
… data output is too slow/ too fast?	The standard setting for intervals between data strings is 1 second (for GA44 Printer). The interval can be chosen when configuring (PSE): 0.0, HS, 1, 2 seconds.

Accessories

Thermal printer (for written records of weighing data) Supplied complete with cable		**GA44**
Connecting cable Current Loop 15 pin - 5 pin		**47936**
Connecting cable RS232C		
15 pin - 25 pin	male	**33640**
	female (e.g. for IBM-PC, XT)	**33995**
Connecting cable for printer		
Epson P-40		**33688**
Connecting cable for computer		
Epson HX-20		**33955**
PX-4		**33982**
Adapter for data transfer		
with connector for foot-operated or manual switch		**47473**
Foot-operated switch		**46278**
Manual switch		**42500**

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P702742

Subject to technical changes and to the availability of the accessoires supplied with the instruments.

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