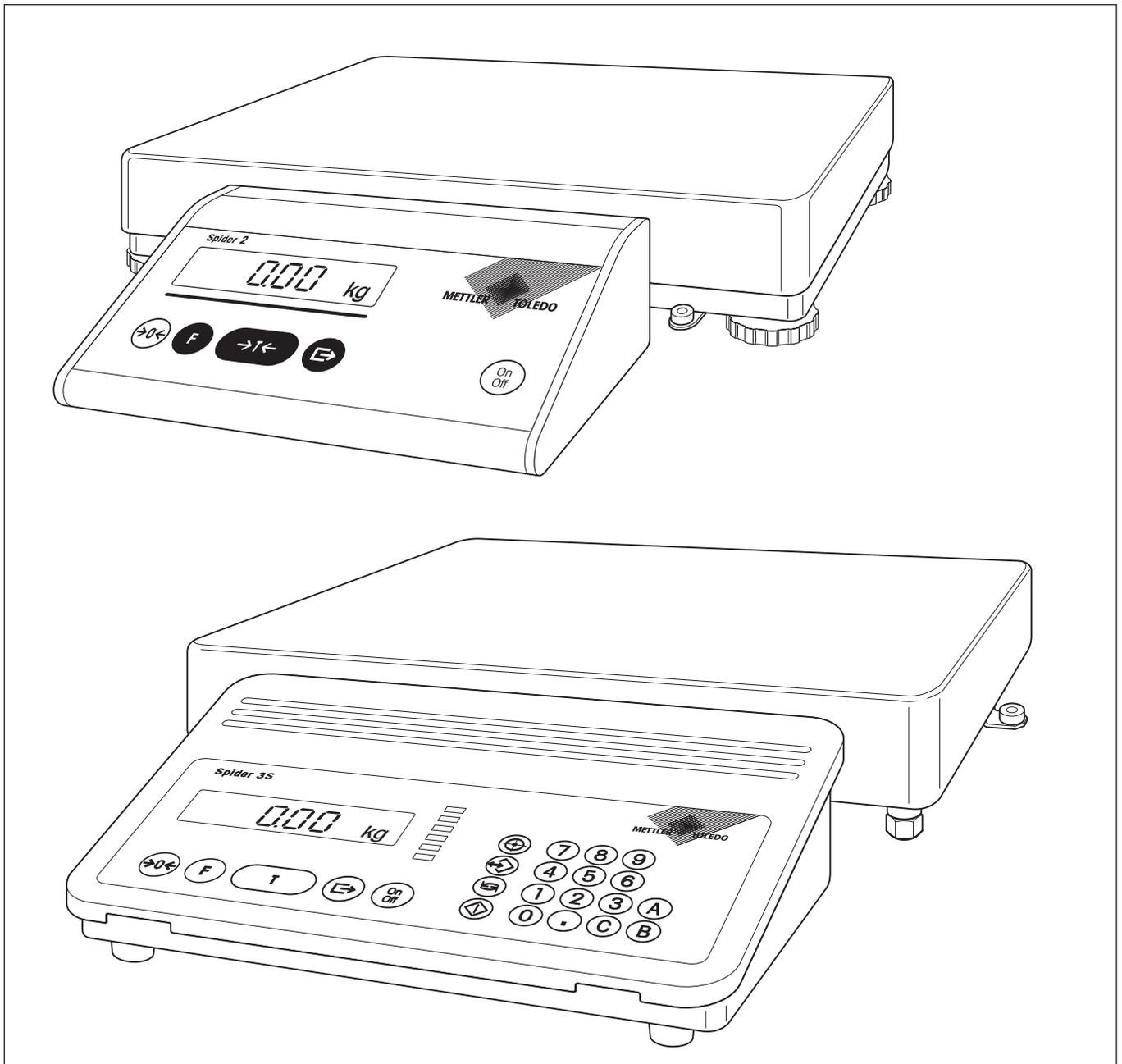


Interface description

METTLER TOLEDO

Spider and Spider S scales



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1. Important information before you start

This section provides you with basic information on the interfaces of your Spider or Spider S scales. Please read through this section carefully and be sure to familiarize yourself with the safety instructions and information contained in this interface description!

1.1 Introduction

Your METTLER TOLEDO Spider or Spider S scale has been equipped in the factory with a serial data interface of the type RS232C. Your scale can use this interface to communicate with a printer or a computer. A second RS232C interface with hardware handshake is available as an option and can be used to expand the communication possibilities of your scale. The interface RS422/485 is also available as an option and allows longer transmission distances or networking of the scale in a bus system.

Please read through this description thoroughly so that you can utilize all possibilities of your interfaces to the full.

1.2 What you should know about these instructions

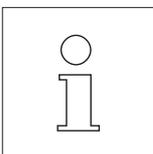
These instructions are a supplement to the operating instructions you received with your scale. We thus advise you to have the operating instructions ready to hand at all times.

Please note the following information:

- Before you can use the interfaces of your scale, you must configure them in the **master mode**. You will find information on how to call up and use the master mode in section 4 of the operating instructions of your scale. This interface description presupposes that you are familiar with working in the master mode.
- You will find information on the installation of optional interfaces in the instructions accompanying the particular option. In this interface description it is assumed that the optional interface (if present) is already built in.
- Please heed and comply with all safety instructions listed in the operating instructions of your scale:



- This symbol indicates safety and hazard instructions which, if not complied with, can lead to personal injuries to the user, damage to the scale or other tangible assets, as well as to malfunctions or undesirable results.



- This symbol indicates additional information and instructions which facilitate your handling of the scale and the interfaces and contribute to proper and economic use.

2. Attachment of peripheral devices

2.1 Introduction

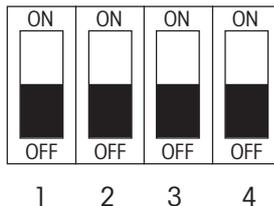
Using the **RS232C interface** you can connect your scale to a printer, any PC (or another computer), another scale or an optional auxiliary display assuming the device to be attached also has a **serial interface of the RS232C type**. If your scale is equipped with the optional, second RS232C interface, you can also attach two devices simultaneously. The optional **RS422/485 interface** also allows the connection of different peripheral devices and in addition makes longer transmission distances possible. Further, this interface permits the networking of your scale in a bus system.

Trouble-free data transmission requires **use of the proper cable**. You can purchase suitable interface cables from METTLER TOLEDO. Please note here the information in section 6 of this description.

2.2 Important information on the RS422/485 interface

The optional RS422/485 interface for the Spider Terminals is supplied without a connector. A terminal strip is available on the interface board for the attachment of peripheral devices and its pin assignment is described in section 6.

The boards of the RS422/485 interfaces for the Spider or Spider S Terminal are equipped with a DIP switch which must be set before putting into operation. The following setting possibilities are available:



Switch	ON	OFF
1	RS485 (2-wire line, half duplex operation)	RS422* (4-wire line, full duplex operation)
2	Terminating resistor 150 Ω between TXD A and TXD B (pins 1 and 2)	No terminating resistor*
3	not assigned	
4	Terminating resistor 150 Ω between RXD A and RXD B (pins 3 and 4)	No terminating resistor*

* Factory setting

2.3 Attaching the devices

Ensure that the scale terminal and the device to be attached are switched off. **Devices operated from the power line must be disconnected from the supply line**. Attach the peripheral device with the suitable interface cable to the scale terminal. When routing the cable, ensure that it does not interfere with your daily work practices and can not be damaged.

3. Configuration of the interfaces

Before you can use the interfaces of your scale, you must configure them, i.e. adapt them to the desired operating mode. You perform this configuration in the **master mode** of your scale. Call-up and use of the master mode are described in section 4 of the operating instructions. Familiarization with the master mode is presupposed.

Important: When it is switched on, the scale terminal automatically detects the installed interfaces. Before configuring the interface(s) in the master mode, we recommend you switch off the terminal and any peripheral devices already attached. Then just switch the terminal on again. This procedure assures correct recognition of the installed interface(s). After the terminal has been switched on, you can configure the interface(s) in the master mode.

3.1 Information on the master mode block for the interface

The master mode is divided into different blocks whose number depends on the scale. You will find an overview of all master mode blocks of your scale in the operating instructions.

A rectangular digital display showing the text "IFACE 1" in a seven-segment font.

One of the master mode blocks (denoted by "IFACE 1") allows you to configure the scale interface RS232C installed in the factory.

A rectangular digital display showing the text "IFACE 2" in a seven-segment font.

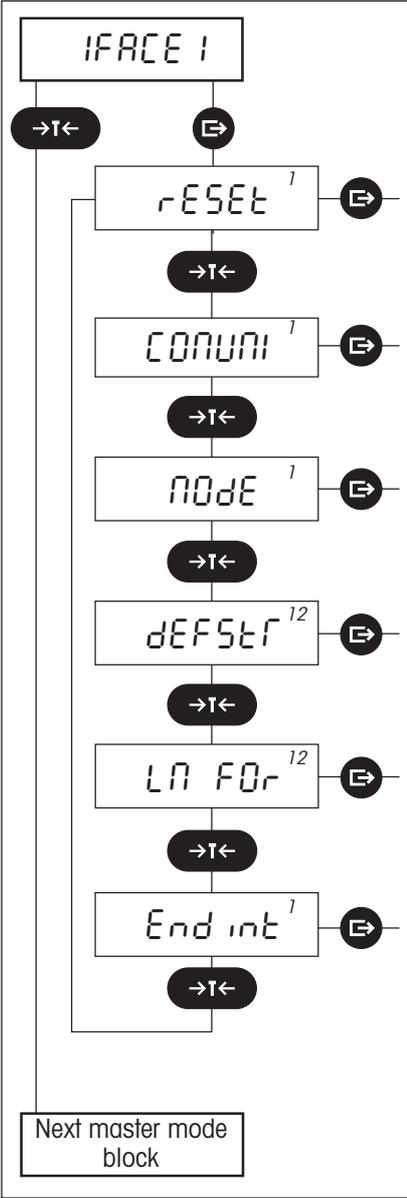
If your scale is fitted with an optional second interface (RS232C or RS422/485), the master mode offers an additional block (denoted by "IFACE 2"). This second block is used to configure the optional interface.

Basically, both blocks offer the same setting possibilities. In this description, only the master mode block for the first RS232C interface ("IFACE 1") installed in the factory is described, but the information also applies analogously to the second block ("IFACE 2"). If different setting possibilities exist in the second block, these are separately explained in the text.

As the master mode block for the interface is very extensive, it has not been described in the operating instructions but separately in this interface description. You will find a detailed description of the master mode block for the interface in the following sections.

3.2 Layout of the master mode block for the interface

The master mode block for the interface is divided into different main blocks which in turn contain subblocks. This section shows you the main blocks (1st level) of the master mode block for the interface.



The master mode block for the interface includes the **following main blocks**:

Resetting to the factory settings ("RESET")
In this block you can reset all settings for the interface to the factory settings.

Communication parameters ("COMUNI")
In this block you specify the settings for the data transmission.

Operating mode of the interface ("MODE")
You can use this block to specify the operating mode of the interface.

Data for transmission ("DEFSTR")
In this block you define what data should be transmitted via the interface.

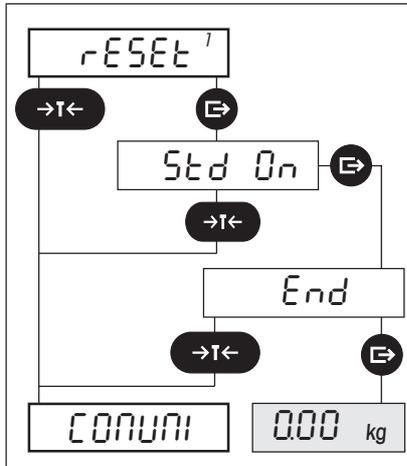
Define print format ("LN FOR")
This block is used to define how the data should be formatted on the attached printer.

Exit the master mode block for the interface ("ENDINT")
In this block you decide whether you would like to exit the master mode block for the interface or make further changes to the settings.

Note: The index ("1" and/or "2") in the top right of the display is used as an orientation aid. It shows you what interface is currently being configured. Index "12" indicates that the block in question applies to both interfaces, i.e. that the parameters can be changed only for the two interfaces simultaneously. This index also appears if the optional interface ("2") is not installed.

The 6 main blocks and their associated subblocks are described in detail in the following sections.

3.3 Resetting to the factory settings



In the first main block you can reset all settings for the interface to the factory settings.

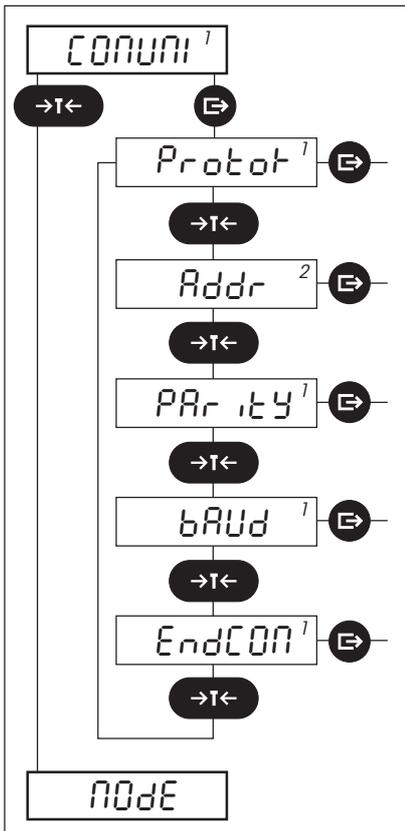
We advise you to exercise caution when making use of this possibility as all settings in the master mode block for the interface are reset to the factory settings and you thus lose all your individual settings!

After resetting, the interface operates with the following **factory settings**:

Parameter	Factory setting
Data transmission protocol	XON/XOFF
Parity	Even (even)
Data transmission rate	2400 baud (2400)
Operating mode	Printer (Print)
Data for transmission	Gross weight (gross), tare weight (tare), net weight (net), all application-specific values except the display value
Print format	Multi (new line for every value)

You will find detailed information on the individual parameters and their meaning in the following sections.

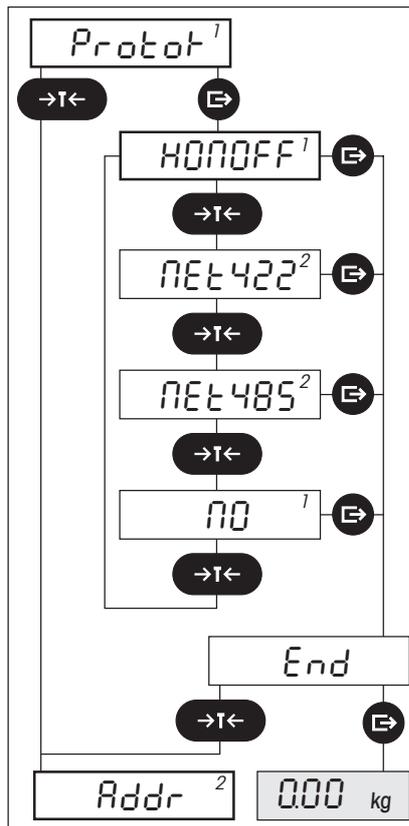
3.4 Selecting communication parameters



In the second main block you set the parameter for data transmission via the interface. This main block comprises 4 or 5 subblocks:

- **Data transmission protocol ("PROTOK")**
- **Address ("ADDR"):** This block is available only in the master mode block for the second interface ("IFACE 2") and appears there only if the optional RS422/485 interface is installed and set to network operation! You will find information on network operation in section 5.2.
- **Parity ("PARITY"):** This block does not appear if the optional RS422/485 interface is installed and set to network operation!
- **Data transmission rate ("BAUD"):** This block does not appear if the optional RS422/485 interface is installed and set to network operation!
- **Exit the main block for the communication parameters ("ENDCOM")**

The following sections describe the four subblocks and the associated setting possibilities in detail.



Data transmission protocol

In this block you select the communication protocol to be used. **Please note that the two devices which have to communicate with each other must use the same setting.** Note also the operating instructions of the device which you attach to the interface of your scale.

When it is switched on, the scale terminal automatically detects the installed interfaces. Different setting possibilities are available depending on which interfaces are installed in your terminal:

- For the **RS232C interface(s)** the settings "NO" and "XONOFF" are available: Select the setting "NO" if you wish to work without protocol. If you wish to work with data flow control, select the "XON/XOFF" protocol (factory setting). We advise you to use the factory setting (XON/XOFF). This setting is suitable for both the attachment of a printer and a PC.

Note: The optional second RS232C interface always operates with hardware handshake, irrespective of the data transmission protocol. If the handshake line is interrupted, the interface operates without hardware handshake, but uses the "XON/XOFF" protocol if this has been selected.

- If an **RS422/485 card** is built in as a second interface, you have additional possibilities available:
 - If you wish to use the interface for **point-to-point connections** similar to an RS232C interface, select the setting "XONOFF" (flow control via the "XON/XOFF" protocol, for RS422 operation only) or "NO" (no protocol).
 - If you wish to link your scale in a **bus network** (serial connection), select "NET422" for the RS422 full duplex operation (4-wire line) or "NET485" for the RS485 half duplex operation (2-wire line). Please note that only one of the two setting possibilities is available corresponding to the setting of the DIP switches on the interface card. You will find further details on the network operation in section 5.2.

Address

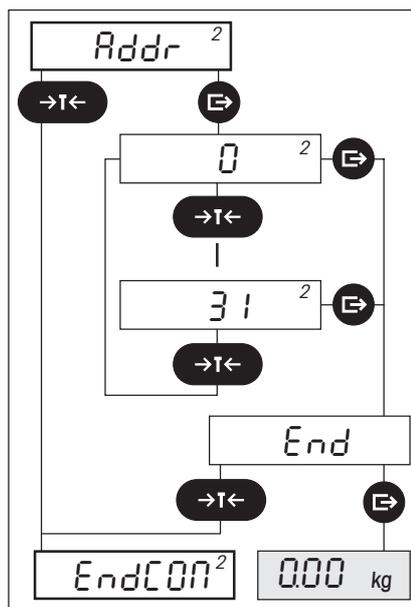
This block is available only if ("PROTOK") "NET422" or "NET485" has been selected in the block for the data transmission protocol!

In this block you assign a unique address to your scale terminal for operation in a network.

The addresses in the range 0 to 31 are available.

Ensure that the address which you assign to your terminal is not already being used by another device in the bus!

You will find further details on network operation in section 5.2.



Parity and number of data bits

In this block you specify the number of data bits and the parity for the data transmission.

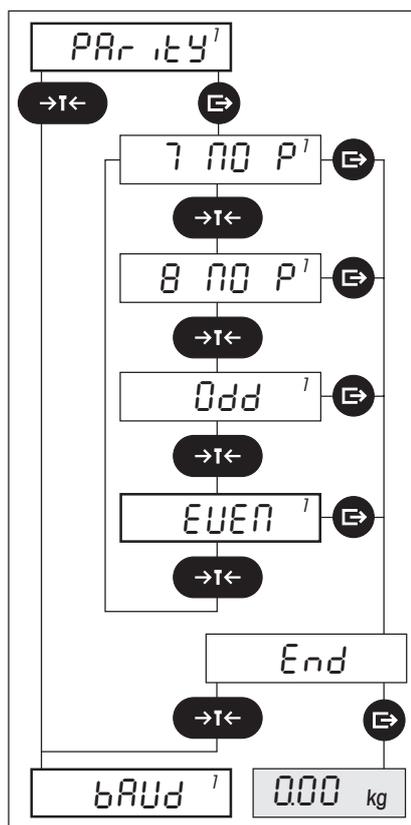
This block is not available if ("PROTOK") "NET422" or "NET485" has been selected in the block for the data transmission protocol (in this case the interface operates with 7 data bits/even parity and this setting can not be changed).

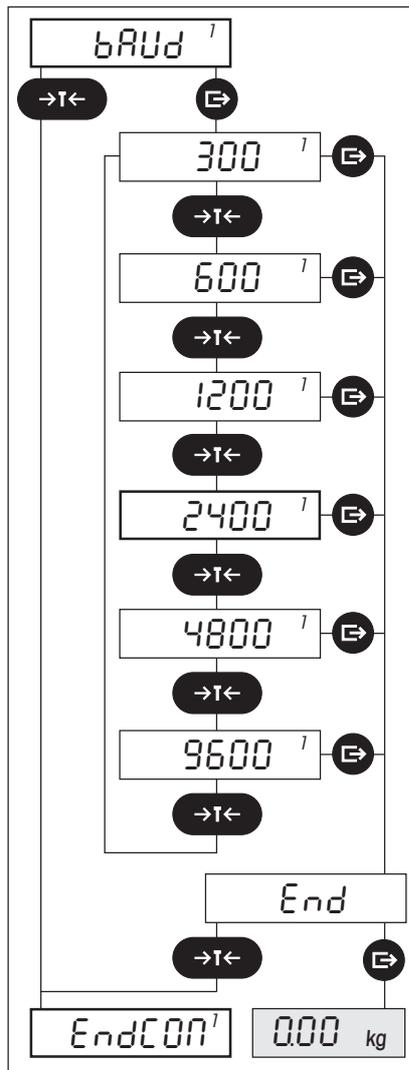
Please note that the two devices which have to communicate with each other must operate with the same setting. Also consult the operating instructions of the device you attach to the interface of your scale.

The following settings are available:

- 7 data bits, no parity ("7 NO P")
- 8 data bits, no parity ("8 NO P")
- 7 data bits, odd parity ("ODD")
- 7 data bits, even parity ("EVEN"). This is the **factory setting**.

We advise you to use the factory setting (even parity). **This setting is suitable for the attachment of both a printer and a PC.**





Data transmission rate

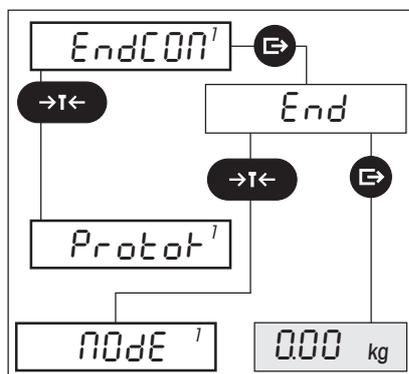
You use this block to specify the data transmission rate (rate of data communication).

This block is not available if ("PROTOK") "NET422" or "NET485" has been selected in the block for the data transmission protocol (in this case the interface operates with 9600 baud and this setting can not be changed).

Please note that the two devices which have to communicate with each other must use the same setting. Note also the operating instructions of the device you attach to the interface of your scale. You can set values between 300 and 9600 baud.

The **factory setting** is 2400 baud.

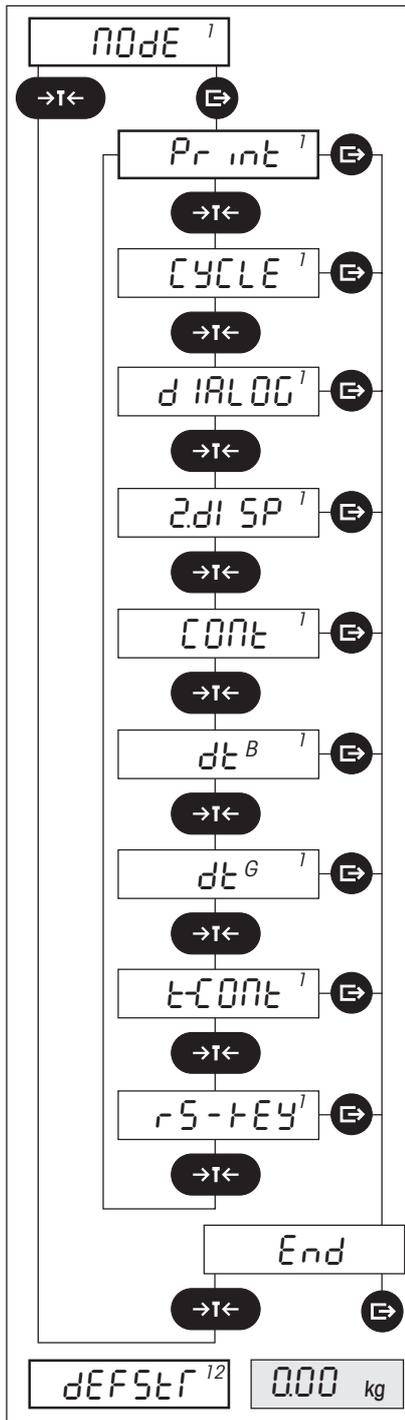
We advise you to use the factory setting. **This setting is suitable for the attachment of both a printer and a PC.** However, if your device supports other data transmission rates, the data transfer can be accelerated by setting the appropriate value.



Exit from the main block "Communication parameters"

In this block you decide whether you wish to exit the main block for selection of the communication parameters or whether you wish to make further changes to the settings.

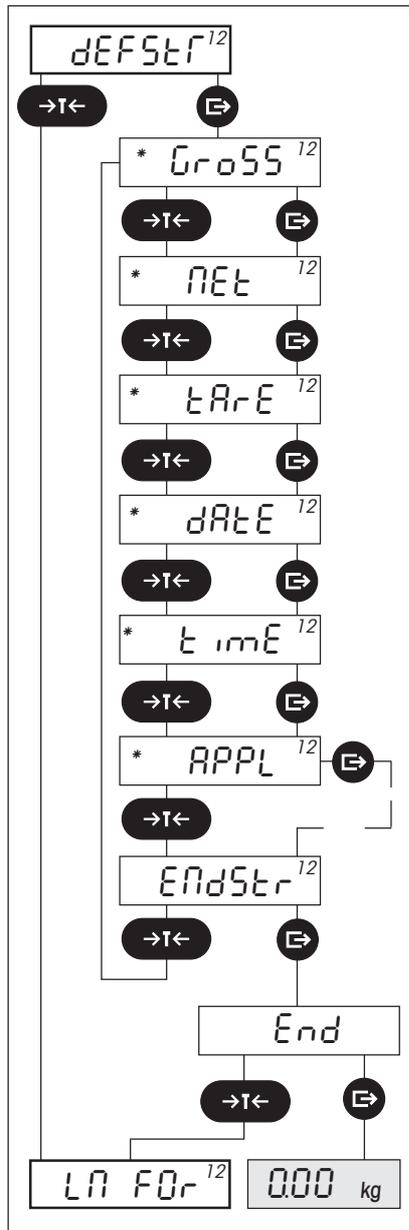
3.5 Selecting operating mode of the interface



In the third main block you select the operating mode of the interface:

- **Attachment of a printer ("PRINT")**
The interface can transfer data to the attached printer. Data transmission is in one direction only (unidirectional), from the scale to the printer. This is the **factory setting**.
- **Recording of series weighings ("CYCLE")**
After every deflection >5d the scale sends a data record via the interface as soon as stability is reached. A requirement is that the value must differ by more than 5d from the zero or tare value. The data transmission is unidirectional, from the scale to the peripheral device.
- **Attachment of a computer ("DIALOG")**
The interface can receive commands from a computer and return responses. Data transmission is thus bidirectional (in both directions).
- **Attachment of an auxiliary display ("2. DISP")**
This setting is used to attach the optional auxiliary display (connection possible only to the interface installed in the factory). With Spider 2S and 3S this setting is not available.
- **Continuous data transmission ("CONT")**
All weight values are transmitted continuously analogous to the SICS command "SIR" (see section 5.2). The data output can be stopped only by switching off the scale.
- **DigiTOL mode ("DT^B")**
Data output in the DigiTOL-compatible format. The gross weight is marked by "B" ("Brutto" = German designation for gross weight). You will find details in the operating instructions of the DigiTOL scale. With Spider 3 and 3S this setting is not available.
- **DigiTOL mode english ("DT^G")**
Data output in the DigiTOL-compatible format. The gross weight is marked by "G". You will find details in the operating instructions of the DigiTOL scale. With Spider 3 and 3S this setting is not available.
- **Toledo mode ("T-CONT")**
Continuous data output in the Toledo-compatible format. You will find details in the operating instructions of the Toledo scales. With Spider 3 and Spider 3S this setting is not available.
- **Digital input ("RS-KEY")**
The digital input of the first interface (pin 9) is assigned a key («←E→», «→T←» or «F»). For assignment to the desired key, short circuit pins 9 and 5 (GND) and at the same time press the desired key on your terminal. Connection of a contact (e.g. a foot switch) between pins 9 and 5 (GND) of the interface allows triggering of the corresponding key function. **Note:** If the "RS key" is selected as the operating mode, the interface can be used in the "Print" mode.

3.6 Defining data for transmission

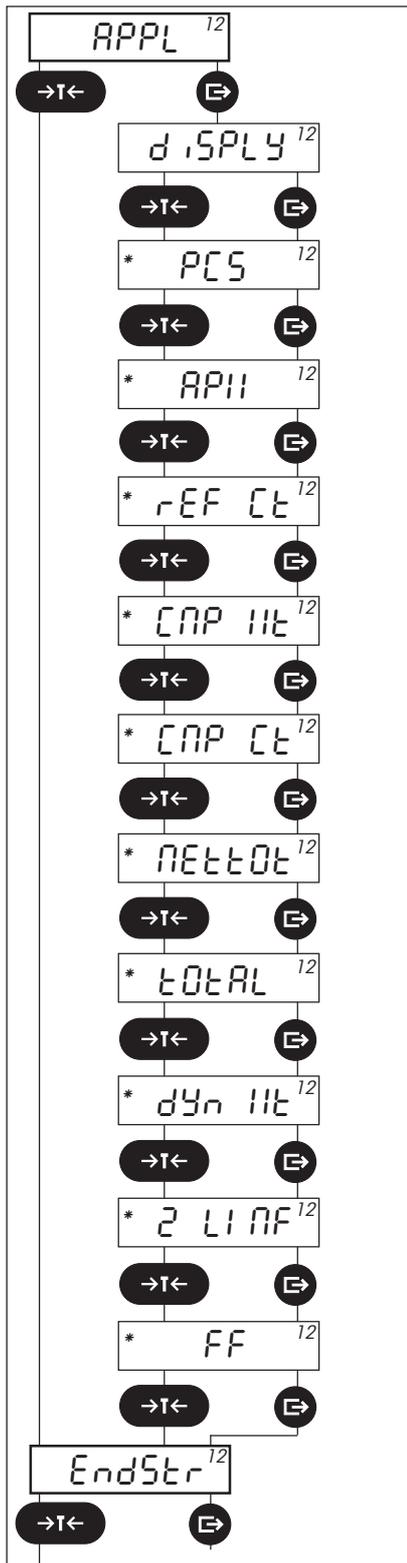


In the fourth main block you define what data should be transmitted via the interface. **These settings are effective only in the unidirectional operating modes of the interface "PRINT" and "CYCLE"** (description, see previous section)!

- **Gross weight ("GROSS")**
The scale transmits the gross weight (weighing sample plus tare) via the interface. This setting is **activated in the factory**.
- **Net weight ("NET")**
The scale transmits the net weight value (weighing sample without tare) via the interface. This setting is **activated in the factory**.
- **Tare weight ("TARE")**
The scale transmits the tare weight value. This setting is **activated in the factory**.
- **Date ("DATE")**
The scale sends the current date via the interface. This setting is available only with Spider 3/Spider 3S and is **activated in the factory**.
- **Time ("TIME")**
The scale sends the current time via the interface. This setting is available only for Spider 3/Spider 3S and is **activated in the factory**.
- **Application-specific values ("APPL")**
Application-specific values are transmitted via the interface. This setting is **activated in the factory**.
 - With the Spider 1/Spider 1S scales, this subblock is not available as these scales have no applications.
 - You will find a detailed description of this subblock and the settings in the next section.
- **Exit the main block for defining the data for transmission ("ENDSTR")**

Notes:

- In this main block (and in the subblock "Application-specific values APPL"), you can activate one, several or all of the available setting possibilities at the same time, they are not mutually exclusive. For example, you can transmit the gross weight, the tare weight and the net weight via the interface simultaneously (this is the factory setting of the scale). As soon as you press the «**↵**» ("YES") or «**→T←**» or «**T**» ("NO") key, the display flashes twice briefly to confirm that the change has been made. The next subblock then appears. **The activated settings are marked by the asterisk symbol.**
- In the weighing mode, the values activated in this main block are transmitted via the interface **by pressing the key «↵»**.
- The application-specific values selected in the sub-block "APPL" are printed out **automatically** when the corresponding application runs.



Application-specific values ("APPL")

Application-specific values are transmitted via the interface. **These settings influence solely the output on a printer, they are thus effective only if you have selected the operating mode "Print"!** These values are transmitted automatically when the corresponding application runs (see description in the operating instructions of your scale). **With the Spider 1/Spider 1S scales, this subblock is not available as these scales have no applications.**

The following table shows you what settings are available for what applications. **All these settings are activated in the factory with the exception of the display value ("DISPLY").**

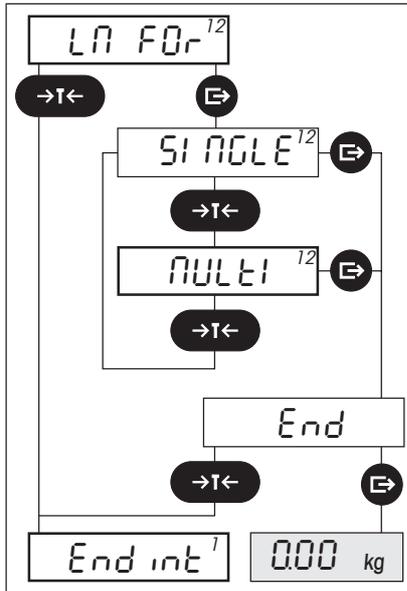
Display	Meaning	Application*			
		1	2	3	4
DISPLY	Display value	x	x	x	x
PCS	Piece count	x			
APW	Average Piece Weight	x			
REF CT	Reference Count	x			
CMP WT	Component Weight		x	x	
CMP CT	Component Count		x	x	x
NETTOT	Net Total		x	x	x
TOTAL	Gross total			x	
DYN WT	Dynamic Weight (not available with Spider 3/Spider 3S)				x
2 LINF	Insert 2 blank lines	x	x	x	x
FF	Page advance for label printer (from software version 2.38 for Spider 2, 2.48 for Spider 2S and 3.55 for Spider 3/3S)	x	x	x	x

* Applications:

- 1 Piece counting
- 2 Formula weighing/formulation
- 3 Totalization
- 4 Dynamic weighing (Spider 2/Spider 2S only)

You will find further information on printing out data and corresponding specimen records in section 4. Detailed information on working with applications can be found in the operating instructions of your scale.

3.7 Defining print format

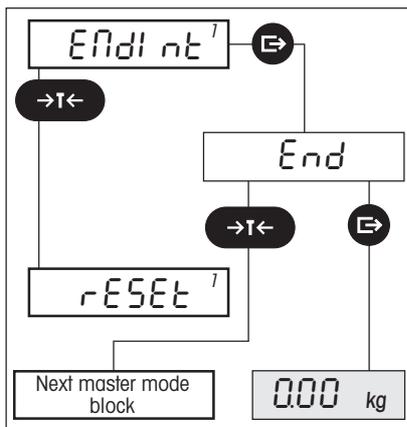


In the fifth main block you specify how the data should be formatted on your printer. **These settings influence solely the output on a printer, they are thus effective only if you have selected the operating mode "Print".**

The following settings are available:

- "SINGLE":
This setting is suitable for **printers with a normal print width**. All values are printed on one line and a switch made to a new line only at the end of a data record.
- "MULTI":
This setting is suitable **for narrow printers** as every value is printed on a new line. This is the **factory setting**.

3.8 Exiting the master mode block for the interface



In the sixth and last main block you can exit the master mode block for the first interface. When you quit the block, your settings are saved.

4. Using the interface with a printer

You can attach a printer to your scale via the RS232C built-in as standard or the optional interface. The optional RS422/485 interface also allows the attachment of a printer, but only in point-to-point operation.

4.1 Preparatory work

To ensure the scale transmits the desired data to the printer, the following requirements must be met:

- The printer must be **attached correctly** (see section 2) and **the communication parameters of the scale and the printer must match**. Your scale is set in the factory so that most printers can be attached without any problems (see section 3.4 and the operating instructions of your printer).
- If you attach a printer to the **optional RS422/485 interface**, the interface must **not** be configured for network operation (see section 3.4).
- **The operating mode of the interface must be set to "PRINT"** (see section 3.5). This is the factory setting.
- **The data to be printed must be defined** (see section 3.6). The interface is configured in the factory for printout of the gross weight, the tare weight and the net weight.
- If your scale supports applications and you wish to print out data specific to these applications, you must **define the application data** to be printed (see section 3.6). Your scale is set in the factory so that all application-specific data are printed with the exception of the display value.

4.2 Printing out data manually



- In the weighing mode, press the «» key and the desired data are transferred to the printer.

G	48.74	kg
T	3.61	kg
N	45.13	kg

The illustration opposite shows the specimen printout of a **simple weighing** which you can expect with the factory settings (gross, tare and net weight).

In **simple piece counting without totalization of piece numbers**, your record will resemble the specimen opposite (printout of a Spider 3/3S scale).

A:	7896	
Date	10.10.97	
Time	13:40	
B:	86	
G	2.220	kg
T	0.138	kg
N	2.082	kg
PIECE WT	18.000	g
REF PCS	10	
T O T A L	116	PCS

In addition to the gross, tare and net weight ("G", "T" and "N"), the average piece weight ("PIECE WT"), the reference quantity ("REF PCS") and the total piece number ("TOTAL ... PCS") are printed out.

Note: Date and time as well as the identification entries "A" and "B" (if used) are recorded only with the Spider 3/3S scale.

4.3 Automatic printout of application-specific data

Note to users of a Spider 1/1S scale: You need not read this section as the Spider 1/1S has no applications.

If you have selected **application-specific data** in the master mode for transmission (see section 3.6), these are recorded **automatically** when the application runs (with the exception of the simple piece counting without totalization of piece numbers).

The specimen records have been printed with a Spider 3/3S scale. If you work with a Spider 2/2S scale, your records will differ somewhat from the specimens shown.

Piece counting with totalization of piece numbers (Spider 3/3S only)

```

A:                7896
Date              10.10.97
Time              13:42

B:                86
n                 1

G                2.220 kg
T                0.138 kg
N                2.082 kg

                116 PCS
*****

B:                681
n                 2

G                4.738 kg
T                0.138 kg
N                4.600 kg

                256 PCS
*****

A:                7896
n TOTAL          2

G TOTAL          6.958 kg
N TOTAL          6.682 kg

PIECE WT        18.000 g
REF PCS         10

T O T A L       372 PCS
*****

```

1. Header of the record

1 Date, time and identification entry "A".

2. Results of the individual weighings

In this section the results of the individual piece number determinations are printed out, separated in each case by a horizontal line of asterisks. The following data are recorded:

- the identification entry "B"
- the consecutive number of the particular weighing ("n")
- the gross, tare and net weight of the particular weighing ("G", "T" and "N"). If you are working with the Spider 3/3S and a preset tare (manual entry of the tare value or recall of a stored tare value), this is marked by "PT" and reported in place of the tare weight "T". Note: All these values are recorded only if you work with a weighing container (tare).
- the determined piece number of the particular weighing ("PCS").

3. Result of the totalized individual weighings

In this section the totalized results of the individual weighings are printed out. The following values are recorded:

- the identification entry "B"
- the number of totalized individual weighings ("n TOTAL")
- the totalized gross and net weight of all individual weighings ("G TOTAL" and "N TOTAL")
- the average piece weight ("PIECE WT")
- the number of reference pieces ("REF PCS")
- the totalized piece number from all individual weighings ("TOTAL ... PCS").

Notes:

- The header of the record is printed out only if at least one of the variables "GROSS", "NET", "TARE", "PCS", "APW" or "REF CT" is activated (section 3.6).
- The result of the totalized individual weighings is recorded only if one of the application-specific values "PCS", "APW" or "REF CT" is activated.

Totalization

A:	7895214		
Date	10.10.97		
Time	15:21		
B:	985		
n	1		
G	1.206	kg	
T	0.082	kg	
N	1.124	kg	
COMP WT	1.124	kg	

B:	681		
n	2		
G	1.828	kg	
T	0.082	kg	
N	1.746	kg	
COMP WT	1.746	kg	

B:	681		
n	3		
MN COMP WT	1.2	kg	

A:	7895214		
n TOTAL	3		
G TOTAL	4.234	kg	
N TOTAL	4.070	kg	

The printout is divided into the following sections:

1. Header of the record

Date, time and identification entry "A".

2. Weighing results of the individual items

In these sections the results of the weighing in of the individual items are printed out. The following data are recorded for each item:

- the identification entry "B"
- the number of the item ("n")
- the gross, tare and net weight of the item ("G", "T" and "N"). If you are working with the Spider 3/3S and a preset tare (manual entry of the tare value or recall of a stored tare value), this is marked by "PT" and reported in place of the tare weight "T". Note: All these values are recorded only if you work with a weighing container (tare).
- the net weight of the weighed-in item ("COMP WT").

3. Manual entry of a known weight value

This section is printed out only if you enter a weight value manually. The following data are recorded for the manually entered items:

- the identification entry "B"
- the number of the item ("n")
- the inputted net weight of the item ("MN COMP WT").

4. Result of the totalized individual weighings (items)

In this section the totalized weighing results of all items are printed out. The following values are recorded:

- the identification entry "A"
- the number of totalized items ("n TOTAL")
- the totalized gross weight of all items ("G TOTAL")
- the totalized net weight of all items ("N TOTAL").

Notes:

- The header of the record is printed out only if at least one of the variables "GROSS", "NET", "TARE", "CMP WT", "CMP CT", "NETTOT" or "TOTAL" is activated (section 3.6).
- The weighing results of the individual items are recorded only if the application-specific value "CMP WT" is activated.
- The result of the totalized individual weighings is recorded only if one of the application-specific values "CMP CT", "NETTOT" or "TOTAL" is activated.

Formula weighing

```

A:          951472
Date       10.10.97
Time      16:38
----- 1
B:          5412
n           1
-----
G          1.662 kg
T          0.642 kg
N          1.020 kg
----- 2
COMP WT    1.020 kg
*****
B:          6632
n           2
----- 2
COMP WT    0.582 kg
*****
B:          8963
n           3
----- 3
MN COMP WT 7.5 kg
*****
B:          9411
n           4
----- 2
COMP WT    0.224 kg
*****
A:          951472
n TOTAL    4
----- 4
G TOTAL    9.968 kg
N TOTAL    9.326 kg
*****

```

The printout is divided into the following sections:

1. Header of the record

Date, time and identification entry "A".

2. Weighing results of the individual components

In these sections the results of the weighing in of the individual components are printed out. The following data are recorded for each component:

- the identification entry "B"
- the number of the component ("n")
- the gross, tare and net weight of the component ("G", "T" und "N"). If you are working with the Spider 3/3S and a preset tare (manual entry of the tare value or recall of a stored tare value), this is marked by "PT" and reported in place of the tare weight "T". Note: All these values are recorded only if you work with a weighing container (tare).
- the net weight of the weighed-in component ("COMP WT").

3. Manual entry of a known weight value

This section is printed out only if you have entered a weight value manually. The following data are recorded for the manually entered component:

- the identification entry "B"
- the number of the component ("n")
- the inputted net weight of the component ("MN COMP WT").

4. Result of the totalized individual weighings (components)

In this section the totalized weighing results of all components are printed out. The following values are recorded:

- the identification entry "A"
- the number of totalized components ("n TOTAL")
- the totalized gross weight of all components ("G TOTAL")
- the totalized net weight of all components ("N TOTAL").

Notes:

- The header of the record is printed out only if at least one of the variables "GROSS", "NET", "TARE", "CMP WT", "CMP CT", "NETTOT" or "TOTAL" is activated (section 3.6).
- The weighing results of the individual items are recorded only if the application-specific value "CMP WT" is activated.
- The result of the totalized individual weighings is recorded only if one of the application-specific values "CMP CT", "NETTOT" or "TOTAL" is activated.

4.4 Automatic printout from plus/minus applications (Spider 3S only)

If you work with the plus/minus applications of the Spider 3S scale, in addition to the weighing values the preselected target values and tolerances are also automatically recorded.

In what follows you will find a representative specimen record for the plus/minus applications "Weighing in", "Checkweighing" and "Classifying". You will find specimen records for the application "Filling with Spider 3S scales" in the separate operating instructions for the filling application (21254202).

Weighing in and checkweighing

```
A:          4578963
Date       10.10.97
Time      17:32

TARGET    4.500 kg
TOLER. (+) 0.090 kg
TOLER. (-) 0.060 kg

B:          5363
*****
```

The printout is divided into the following sections:

1. Target weight and tolerances

1 This part of the record is automatically printed out as soon as you change the target weight and/or a tolerance value. The date, the time and the identification entry "A" are listed. These are followed by the target weight ("TARGET") and the tolerance values. The identification entry "B" is used as a reference for the separately recorded weighings.

```
A:          4578963
Date       10.10.97
Time      17:33

B:          5263

          4.510 kg
```

2. Record of the weighing

2 This part of the record is automatically printed out as soon as a weighing-in or checkweighing operation has been completed. The determined weight value is recorded. The identification entry "A" is used as a reference for the separately recorded values for target weight and tolerances.

Classifying

```
A:          58233
Date       10.10.97
Time      16:07

LIMIT 1    1.950 kg
LIMIT 2    2.050 kg

B:          4720
*****
```

The printout is divided into the following sections:

1. Weight limits

1 This part of the record is automatically printed out as soon as you change one or both weight limits. The date, the time and the identification entry "A" are listed. These are followed by the two weight limits. The identification entry "B" is used as a reference for the separately recorded weighings.

```
A:          58233
Date       10.10.97
Time      16:08

B:          4720
G          2.510 kg
T          0.500 kg
N          2.010 kg
CLASS     2
```

2. Record of the weighing

2 This part of the record is automatically printed out as soon as a classifying operation has been completed. The gross, tare and net weights of the weighing sample ("G", "T" and "N") and the class are listed. The identification entry "A" is used as a reference for the separately recorded weight limits.

5. Using the interface with a PC

This section explains how you can connect your scale to a PC (or a different computer) and how you can send and receive data via the interface. You will also find details on the integration of your scale in a network using the optional RS422/RS485 interface.

5.1 Preparations for the communication

So that your scale can communicate in a point-to-point connection or with the computer via a network, the following two requirements must be met:

- The computer must be **attached correctly**. With the optional RS422/485 interface, ensure **correct setting of the DIP switches** on the interface card. You will find appropriate information in section 2.
- **The communication parameters of the interfaces of the scale and the computer must match**. The communication parameters of the scale interfaces are set in the factory so that data communication with most computers should be possible immediately. The optional **RS422/485 interface** is configured in the factory for point-to-point connection. For operation in a network this setting must be changed and at the same time a correct address defined. For network operation the data transmission rate and the parity are automatically set to fixed values and you must ensure that the computer operates with the same settings. You will find information on the communication parameters in sections 3.4 and in the operating instructions of your computer.
- The **operating mode of the interface** must be set to **"DIALOG"** (for bidirectional data communication between scale and computer) or to **"CYCLE"** (for the recording of series weighings):
 - In the **"DIALOG"** mode you can call up the weighing data manually and transfer commands to the scale. The data communication between scale and computer is thus bidirectional, i.e. in both directions. This setting is a requirement for network operation of the optional RS422/485 interface!
 - In the **"CYCLE"** mode the scale sends the current data automatically to the computer as soon as a deflection of at least 5d appears and the new weight value differs from the zero or tare value by at least 5d. This operating mode is suitable for the result recording of series weighings. In this mode the data communication is unidirectional, i.e. from the scale to the computer.

As the interface is configured in the factory for the attachment of a printer (operating mode "PRINT"), you must change the operating mode if you wish to attach a computer (see section 3.5).

- For communication with the scale, you need a **communication program** on your PC. Many such programs are available commercially and this software is frequently supplied with the computer (e.g. HyperTerminal of Windows®95).

5.2 Information on network operation via the RS422/485 interface

In order to work in network operation, the scale must be equipped with the following software versions:

- Spider 1/1S: Application software version 4.60 or higher and service software 5.31 or higher
- Spider 2/2S: Application software version 2.60 (2.81 with Spider 2S) or higher and service software 5.31 or higher
- Spider 3/3S: Application software version 3.60 or higher and service software 5.31 or higher

In network operation the scale must be addressed by the computer before commands can be transmitted and weighing results received.

Addressing is via the command character <ESC> (1B hex.) followed by the address (in the range 30 hex. ... 3F hex.). The desired command (see next section) can then be transmitted and closed with <CR> (Carriage Return = 0D hex.) and <LF> (Line Feed = 0A hex.). This transfers the bus to the scale which in turn sends back the address to the host as a confirmation. The scale then transmits the response to the command followed by CLRF. It thus passes control back to the host via the bus.

	<ESC> 3A	->	Scale
	SI <CRLF>	->	Scale
Host		<-	<ESC> 3A
Host		<-	S_S____45.02_kg <CRLF>

Example:

The host addresses the scale with the address 3A hex.

The host transmits the command (in this example the "SI" command) to the scale. The command is closed with <CRLF> and the bus transferred to the scale. Note: The host can use ESC to clear a transmitted command.

The scale confirms receipt of the command by sending the address to the host.

The scale transmits the response to the received command to the host and transfers control back to the host via the bus using <CRLF>.

5.3 Transferring commands

You can use the keyboard of your computer to transmit commands to the scale. With these commands you can either initiate actions, transfer parameters or request weighing data. The interface of your scale supports commands following **MT-SICS** (**M**ETTLER **T**OLEDO - **S**tandard **I**nterface **C**ommand **S**et). MT-SICS comprises various command sets (also called "Levels"). You will find a detailed description of the MT-SICS commands in the **MT-SICS reference handbook**, which you can request from your METTLER TOLEDO dealer.

In what follows you will find a list of the commands which are supported by the interfaces of the Spider/Spider S Terminals. The commands described in the MT-SICS reference handbook are not explained again here. New commands and those specific to Spider are described in detail.

Important: MT-SICS comprises standard command sets. Depending on the specific features of the Spider/Spider S scales, the parameters and effects of individual commands may differ somewhat from the description in the MT-SICS reference handbook. In case of doubt, please contact your METTLER TOLEDO dealer!

The interface of your Spider/Spider S Terminal supports the following commands following MT-SICS:

Action	Command	SICS level	Comments
Request SICS level version	I1	0	
Request data of the scale	I2	0	
Request software version/TDNR	I3	0	
Request serial number of scale	I4	0	
Send data record after stability	S	0	
Send data record immediately	SI	0	
Transmit data records immediately	SIR	0	
Tare the scale	T	0	
Zero the scale	Z	0	
Reset the scale	@	0	
Write text into display	D	1W	
Weight display	DW	1	
Key control	K	1	Caution: special implementation
Send weight value after change	SR	1	
Request/set tare	TA	1	
Delete tare value immediately	TAC	1	
Tare immediately	TI	1	
Request/set date	DAT	2 R Standard	Spider 3/3S only
Request/set weighing parameters	MW	2 R Standard	Caution: special implementation
Request/set time	TIM	2 R Standard	Spider 3/3S only
Request/set ID key "A"	I12	3 R Standard	Spider 3/3S only
Request/set ID key "B"	I13	3 R Standard	Spider 3/3S only
Reference weight for piece counting	PW	3 R Standard	Spider 2/2S and 3/3S only
Data transmission at twice the rate	SFIR	---	Description follows
Request/set parameters for applications	PM	---	Spider 2S/3S only, description follows
Start filling application	SAF	---	Description, see instructions for filling application
Start filling application in learn mode	SAFL	---	Description, see instructions for filling application

Continuous transmission of data records at twice the rate ("SFIR" command)

S	F	I	R
----------	----------	----------	----------

This command specific to Spider/Spider S is identical to the command "SIR" from the SICS level 0, however twice the number of data records are sent per time unit (20 data records per second). This setting is especially suitable for dosing applications.

Responses:

S S x1 x2

x1 = stable weight value , x2 = unit

S D x1 x2

x1 = dynamic weight value, x2 = unit

S -

Scale in underload region.

S +

Scale in overload region.

S I

The command has been understood, but can not be executed at present.

Notes:

- If the data transmission rate of the interface is set to a value that is too low, the greater volume of data may not be transmitted correctly. In such a case, increase the data transmission rate of the interface and the computer.
- The continuous transmission of data records at twice the rate is terminated as soon as a key is pressed or an entry made via the interface.

Request and set parameters for applications ("PM" command)



With this command, which is **only available for Spider 2S and 3S**, the parameters for the plus/minus applications (weighing in, checkweighing and classifying) and for piece counting can be requested and defined. You can generate and organize any number of parameter sets for different applications on your computer and transmit these to the scale when needed. In the case of applications or parameters which change frequently, this saves a considerable amount of time as the set values do not have to be redefined each time on the scale. **Note:** With this command the parameters for the filling application of the Spider 3S can also be requested and set. You will find further details in the operating instructions of the filling application.

Important information:

- The PM command always refers to the active application of the scale. Before executing the PM command, you should thus ensure that the desired application has been activated in the master mode!
- All parameters must always be specified! Admissible weight units are: "kg", "g", "t" (metric ton) and "lb" (pound).

PM_x1_x2_x3_x4_x5_x6_x7_x8

Example:

PM_1.4_kg_0.2_kg_0.1_kg_0.8_kg

Weighing in

- x1 Target weight
- x2 Weight unit for target weight
- x3 Upper tolerance
- x4 Weight unit for upper tolerance
- x5 Lower tolerance
- x6 Weight unit for lower tolerance
- x7 Start point (limit value for response of the LEDs)
- x8 Weight unit for start point

PM_x1_x2_x3_x4_x5_x6_x7_x8

Example:

PM_3.8_kg_0.1_kg_0.2_kg_2.6_kg

Checkweighing

- x1 Target weight
- x2 Weight unit for target weight
- x3 Upper tolerance
- x4 Weight unit for upper tolerance
- x5 Lower tolerance
- x6 Weight unit for lower tolerance
- x7 Minimum weight (for response of the LEDs)
- x8 Weight unit for minimum weight

PM_x1_x2_x3_x4_x5_x6

Example:

PM_2.3_kg_3.9_kg_1.3_kg

Classifying

- x1 Upper weight limit for class 1
- x2 Weight unit for upper weight limit of class 1
- x3 Upper weight limit for class 2
- x4 Weight unit for upper weight limit of class 2
- x5 Minimum weight (for response of the LEDs)
- x6 Weight unit for minimum weight

PM_x1_x2_x3_x4_x5_x6_x7_x8

Example:

PM_96_PCS_2_PCS_1_PCS_80_PCS

Piece counting with the plus/minus display

- x1 Target piece number
- x2 Unit for target piece number (only "PCS" admissible)
- x3 Upper tolerance in pieces
- x4 Weight unit for upper tolerance (only "PCS" admissible)
- x5 Lower tolerance in pieces
- x6 Weight unit for lower tolerance (only "PCS" admissible)
- x7 Start point (minimum piece number for response of the LEDs)
- x8 Weight unit for start point (only "PCS" admissible)

PM_A

This **message** confirms that **all parameters have been set**.

PM_L

This **error message** (instead of the confirmation PM_A), is the consequence of a plausibility error. Please note the following **conditions** for the individual applications:

Weighing in

- Target weight - lower tolerance > 0
- Start point < target weight - lower tolerance - 3 digits

Checkweighing

- Target weight - lower tolerance > 0

Classifying

- Weight limit for class 1 < weight limit for class 2
- Minimum weight < weight limit for class 1 - 3 digits

Piece counting

- Piece weight must be specified
- Upper and lower tolerance = 0
- Lower tolerance ≤ target weight
- Start point < target weight - lower tolerance - 3 pieces

PM

Command for **request of the current filling parameters**

PM_A_x1_x2.....

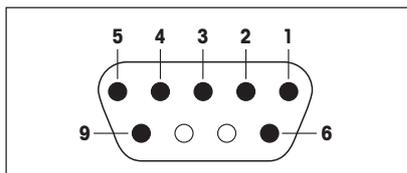
Response to the "PM" request command. The response format corresponds to the command formats described above for entry of the parameters (PM_1_2....). All parameters are shown in the correct weighing unit (or in pieces), irrespective of the unit in which they have been entered.

6. Technical data

6.1 Data of the RS232C interfaces

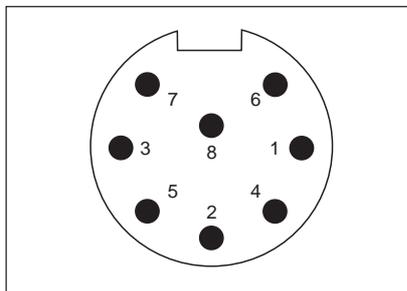
Interface type:	Voltage-controlled interface following EIA RS-232C/DIN 66020 (CCITT V24/V.28)
Max. line length:	15 m
Signal level data lines:	Level "0" (with $R_L > 3\text{ k}\Omega$): +3 V to +25 V (high) Level "1" (with $R_L > 3\text{ k}\Omega$): -3 V to -25 V (low)
Connection:	Spider: D-subminiature, 9-pin, female, Spider S: circular connector, 8-pin
Operating mode:	Full duplex
Transmission mode:	Bit-serial, asynchronous
Transmission code:	ASCII
Protocols/flow control:	None, XON/XOFF
Baud rates:	300, 600, 1200, 2400, 4800, 9600
Data bits:	7 or 8
Stop bits:	Interface 1: receipt min. 1 stop bit, transmission 2 stop bits Interface 2: always 1 stop bit for transmission and receipt
Parity:	None, even, odd

Pin assignment RS232C Spider (view of socket)



- Pin 1: Digital output +5 V/50 mA, interface 1 only
- Pin 2: TxD (send line of scale)
- Pin 3: RxD (receive line of scale)
- Pin 4: DSR (receive line for hardware handshake), interface 2 only
- Pin 5: GND (signal ground)
- Pin 6: DTR (send line for hardware handshake), interface 2 only
- Pin 8: V-ACCU (power supply from external battery, 6.3... 12 VDC/200 mA), interface 1 only
- Pin 9: Digital input for external contact (between pins 5 and 9), interface 1 only

Pin assignment RS232C Spider S (view of socket)

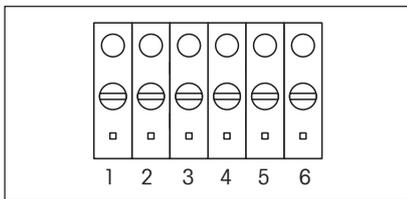


- Pin 1: Shield
- Pin 2: TxD (send line of scale)
- Pin 3: RxD (receive line of scale)
- Pin 4: PONOFF (Power On/Off) with interface 1, DTR with interface 2
- Pin 5: Digital input for external contact (between pins 5 and 6), interface 1 only
- Pin 6: GND (signal ground)
- Pin 7: V-ACCU (power supply from external battery, 6.3... 12 VDC/400 mA), interface 1 only
- Pin 8: BATLOW (external battery exhausted) with interface 1, DSR with interface 2

6.2 Data of the RS422/485 interfaces

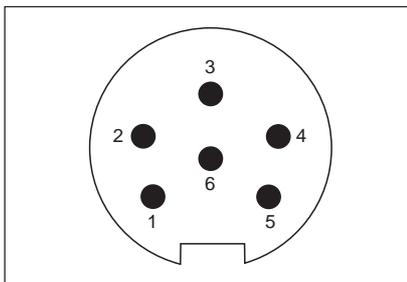
Interface type :	bidirectional differential voltage interface
Electrical isolation:	with optocoupler
Max. line length:	1200 m
Connection:	Spider: 6-pin terminal on interface card, Spider S: circular connector, 6-pin
Operating mode:	half duplex (RS485) or full duplex (RS422), selectable with DIP switch
Addressing (network operation):	Address in range 0 ... 31 can be set via software
Records/flow control:	none, XON/XOFF (RS422 only), NET422 and NET485 for network operation
Baud rates:	300, 600, 1200, 2400, 4800, 9600, in network operation 9600 baud fixed setting
Data bits:	7 or 8, in network operation 7 bit fixed setting
Stop bits:	interface 1: receive min. 1 stop bit, send 2 stop bits interface 2: always 1 stop bit for send and receive
Parity:	none, even, off, in network operation even parity fixed setting

Pin assignment RS422/485 Spider (terminal on interface board)



- Terminal 1: GND (signal ground)
- Terminal 2: Input
- Terminal 3: RxD B (-) (full duplex only)
- Terminal 4: RxD A (+) (full duplex only)
- Terminal 5: TxD/RxD B (-) (for half duplex and full duplex)
- Terminal 6: TxD/RxD A (+) (for half duplex and full duplex)

Pin assignment RS422/485 Spider S (view of socket)



- Pin 1: GND (signal ground)
- Pin 2: Input
- Pin 3: TxD/RxD A (+) (for half duplex and full duplex)
- Pin 4: TxD/RxD B (-) (for half duplex and full duplex)
- Pin 5: RxD B (-) (full duplex only)
- Pin 6: RxD A (+) (full duplex only)

6.3 Parallel output of Spider 3S

You can find the pin assignments and cable descriptions for the parallel output of the Spider 3S Terminal in the operating instructions and installation information "Filling with Spider 3S scales/Digital outputs" (21254202).

6.4 Interface cables

You can obtain the interface cables listed below from your METTLER TOLEDO dealer.

Note: Some cables are supplied with a gender changer (adapter plug which changes the connector type from male to female or the converse). In such a case, the cable and connector designations refer to the cable **with mounted gender changer**.

Interface cables for Spider Terminals

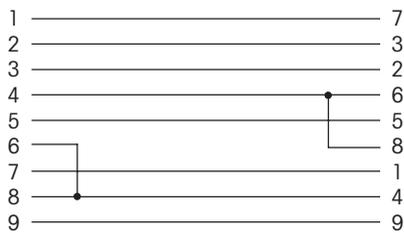


Data cable, 9-pin M/F, length 1.8 m, No. 00410024

This cable connects the Spider Terminal to, for instance, a PC or the GA42 Printer. All pins are connected 1:1. The cable is equipped with a 9-pin D-subminiature connector (M) and a 9-pin D-subminiature socket (F).

Data cable, 9-pin M/M, length 1.8 m, No. 21250066

This cable connects the Spider Terminal to the optional auxiliary display. All pins are connected 1:1. The cable is equipped with two 9-pin D-subminiature connectors.



Data cable, 9-pin M/M, crossed, length 1.8 m, No. 21252588

This cable connects two Spider Terminals (e.g. for piece counting using a second balance/scale). The cable is equipped with two 9-pin D-subminiature connectors (M). The pins are connected as shown in the scheme opposite.

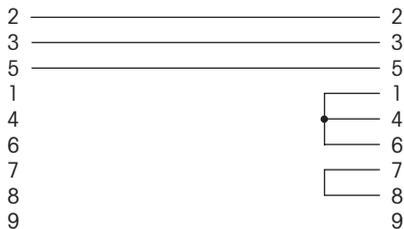
Data cable, 9-pin M/F, crossed, length 1.8 m, No. 21252589

This cable connects a Spider Terminal to a DigiTOL scale (e.g. for piece counting using a second balance/scale). The cable is equipped with a 9-pin D-subminiature connector (M) and a 9-pin D-subminiature socket (F). The pins are connected as shown in the scheme opposite.



Data cable, 9/25-pin M/M, crossed, length 1.8 m, No. 21253677

This cable connects a Spider Terminal to a Spider 1 Printer. The cable is equipped with a 9-pin and a 25-pin D-subminiature connector (M). Only 9 pins are connected as shown in the scheme opposite.

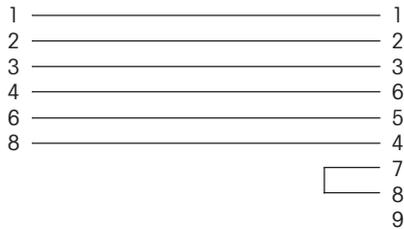


Data cable, 9-pin M/F, length 3 m, No. 21253887

This cable connects special Spider Terminals used in parcel services to a PC. The cable is equipped with a 9-pin D-subminiature connector (M) and a 9-pin D-subminiature socket (F). Only 3 pins between connector and socket are connected as shown in the scheme opposite. At the PC end (socket on right of the scheme) 5 pins are also connected internally.

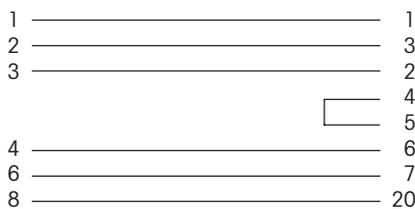
Interface cables for Spider S Terminals

All Spider S cables are equipped with an 8-pin circular connector at the terminal end.



Data cable with 9-pin D-subminiature socket, length 1.8 m, No. 504376

This cable connects the Spider S Terminal to peripheral devices equipped with a 9-pin D-subminiature connector (M) (PC, GA42 Printer, etc.). The pins are connected as shown in the scheme opposite.



Data cable with 25-pin D-subminiature socket, length 1.8 m, No. 504374

This cable connects the Spider S Terminal to peripheral devices equipped with a 25-pin D-subminiature connector (M) (e.g. PC). The pins are connected as shown in the scheme opposite.

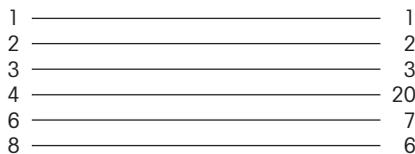
Data cable open end, length 1.5 m, No. 21254280

This cable is open at the peripheral end and can be configured to suit individual needs (e.g. for the attachment of an external start key to the Spider 3S Terminal for filling applications).

Pin	Color	Assignment	
		RS422	RS485
1	white	0V	0V
2	brown	-----	-----
3	green	TXD+	TXD+/RXD+
4	yellow	TXD-	TXD-/RXD-
5	pink	RXD-	-----
6	grey	RXD+	-----

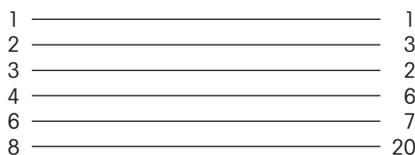
Data cable RS422/485 open end, length 3 m, No. 204933

This cable is equipped at the terminal end with a 6-pin circular connector, but is open at the peripheral end. This cable is used to integrate the Spider S Terminal in an RS422/485 network.



Data cable with 25-pin D subminiature connector, length 3 m, No. 503754

RS232/DTE cable for Spider S Terminals. The pins are connected as shown in the scheme opposite.



Data cable with 25-pin D-subminiature connector, length 3 m, No. 503755

RS232/DCE cable for Spider S Terminals (e.g. for the attachment of a Sprinter 1 Printer). The pins are connected as shown in the scheme opposite.

Circular connector, 8-pin, No. 503756

The 8-pin circular connector has no connections and can be used to prepare your own interface cable.

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Subject to technical changes and to the availability
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Mettler-Toledo GmbH, CH-8606 Greifensee, Switzerland, Tel. (01) 944 22 11, Fax (01) 944 30 60, Internet: <http://www.mt.com>

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| AT Mettler-Toledo Ges.m.b.H., A-1100 Wien
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Tel. (22) 30 44 90, Fax (22) 32 70 02 | For all other countries:
Mettler-Toledo GmbH,
PO Box VI-400, CH-8606 Greifensee,
Tel. (01) 944 22 11, Fax (01) 944 31 70 |
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