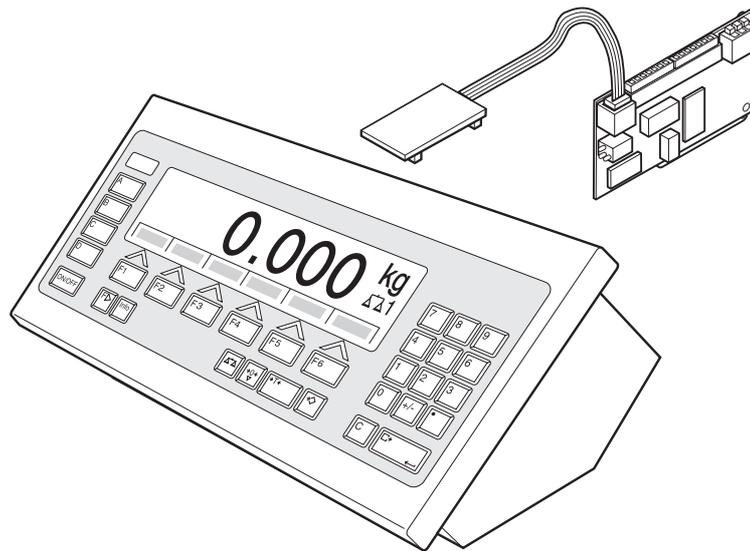# Operating instructions and installation information

METTLER TOLEDO MultiRange
Profibus-DP-ID7 field bus card

0.000 kg

1 Introduction and assembly

1.1 Introduction

With the Profibus-DP-ID7 field bus card the ID7… weighing terminal can be integrated in a Profibus-DP field bus or addressed by a bus master (PLC, PC with Profibus card, etc.).

Documentation

These Operating instructions and installation information contain all information on the mounting and commissioning of the Profibus-DP-ID7 field bus card.

The ID7… weighing terminal is provided with operating instructions and installation information for the original configuration of the weighing terminal. Please see these operating and installation instructions for basic information on working with the ID7… weighing terminal.

1.2 Safety precautions

1.2.1 Installation in explosion protected ID7xx-… weighing terminal

EXPLOSION HAZARD

The ID7xx-… weighing terminal may only be opened by METTLER TOLEDO service technicians.

➜ To install the Profibus-DP-ID7 application software, please contact METTLER TOLEDO Service.

1.2.2 Installing in ID7-… weighing terminal

▲ Only authorized personnel may open the ID7… weighing terminal and install the Profibus-DP-ID7 module.

▲ Before opening the terminal, pull the power plug or switch off the power supply for terminals with a fixed connection.

1.3 Scope of delivery

➜ Check the scope of delivery for completeness:

– Profibus-DP-ID7 field bus card with connected Mini-Combicon terminal strip
– PCB adapter: Ribbon cable with PCB for plugging into the ID7 main PCB and ribbon cable plug for connection to the field bus card.
– 2 screw cable fittings (M 16 x 1.5) with blind plugs
– For mounting in desk unit: 2 square setscrews, 2 mounting bolts, 2 nuts

1.4 Installation

1.4.1 Opening ID7... weighing terminal

Desk unit

1. Unscrew the screws on the underside of the cover.
2. Lay down the cover toward the front. When doing so, make sure that the cables are not damaged.

Wall unit

1. Unscrew the screws on the underside of the cover and fold the cover toward the front. When doing so, make sure that the cables are not damaged.
2. Fold open the mounting plate.

Panel unit

1. Unscrew the 10 hex bolts on cut-out on the inside of the switch cabinet.
2. Remove the cover from the switch cabinet and fold toward the front. When doing so, make sure that the cables are not damaged.
3. Fold open the mounting plate.

1.4.2 Connecting Profibus cable

CE conformity With longer connection cables, shielding measures against radiation and irradiation of interference are particularly important.
The required interference immunity classes will only be achieved with careful installation and wiring of all connected peripherals, weighing platforms and weighing cells. For this purpose the shielding must be connected properly on both ends.
The CE conformity of the entire system is the responsibility of the person commissioning the device.

Cable specification Only use special bus cables with shielding and with a diameter $\geq$ 7 mm. Recommended wire cross-section ≥ 0.34 mm^2.

Connecting Profibus cable to screw cable fitting

1. Strip cable ends sufficiently long (depending on slot up to 250 mm) and shorten the cable shield to 12 to 13 mm.

2. Strip core ends approx. 7 mm and twist.

approx. 12 - 13 mm
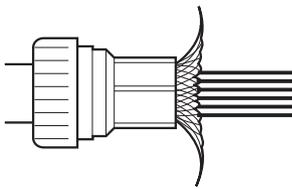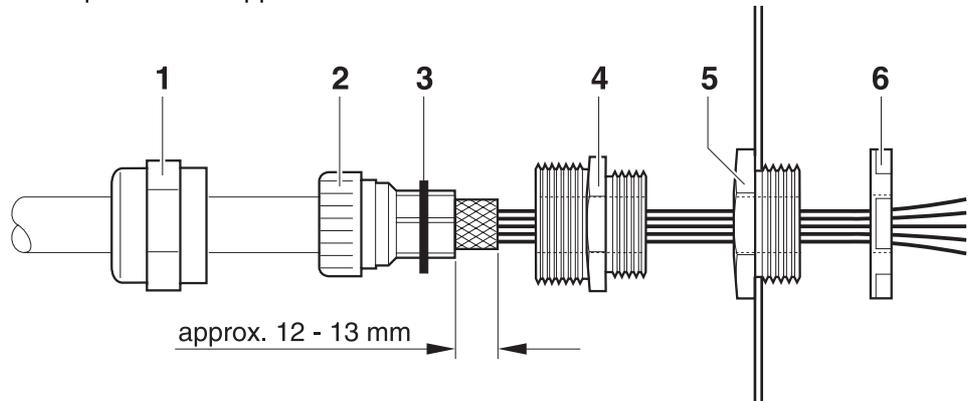
3. Push pressure nut (1) and sealing insert (2) onto cable.

4. Bend over exposed cable shield and place over O-ring (3).

5. Push sealing insert up to cable shield.

6. Remove blind plugs from desired port connection; remove another blind plug for further routing of Profibus-DP if necessary.

7. Mount reducing ring (5) with sealing nut (6) on housing.

8. Screw lower section of PG screw gland (4) into reducing ring.

9. Guide cable into housing.

10. Insert sealing insert into lower section until flush.

11. Screw pressure nut to lower section. The cable gland must be tightened so that a strain relief ≥ 100 N is ensured.
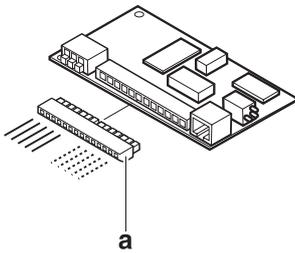
Connecting Profibus cable

➔ Pull the Mini-Combicon terminal strip (a) off the Profibus card and connect the Profibus cable to the terminal strip in accordance with the following table:

| Terminal	Assignment	Note
1	Repeater controller RTS	5-V request-to-send (RTS) signal
2	Data Ground	Reference potential for RS485 level
3	Output data signal B (red)	Positive RS485 signal level, to next node
4	+5 V, insulated	5-V supply, e.g. for optical waveguide adapter
5	Output data signal A (green)	Negative RS485 signal level, to next node
6	–	–
7	–	–
8	Input data signal B (red)	Positive RS485 signal level, from last node
9	Repeater controller RTS	5-V request-to-send (RTS) signal
10	+5 V, insulated	5-V supply, e.g. for optical waveguide adapter
11	Data Ground	Reference potential for RS485 level
12	Input data signal A (green)	Negative RS485 signal level, from last node

1.4.3   Installing Profibus-DP-ID7

in desk unit   **Note**

The print Profibus-DP-ID7 may only be installed standing up and on the side in the desk unit. If a print Ethernet-ID7 is already installed on the side, the print Ethernet-ID7 must be removed from this position and installed on top of the power supply unit instead, see Etthernet-ID7 Operating instructions and installation information.
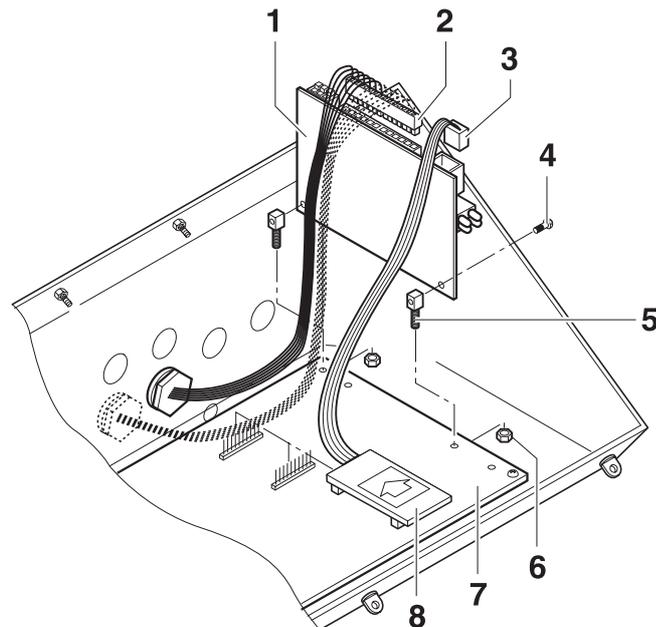
1. Disconnect all plugs and any interfaces present on ID7 PCB.

2. Remove the ID7 PCB.

3. Secure two square setscrews (5) with screws (4) on Profibus-DP-ID7 PCB (1).

4. Plug Profibus-DP-ID7 PCB into main PCB (7) and secure from below with nuts (6).

5. Insert plug (3) of ribbon cable in socket of Profibus card.

6. Insert PCB (8) in free slot of main PCB (COM2 … COM6, preferably COM4). Ensure proper poling of PCB: Arrow on PCB must point toward rear panel of housing.

7. Connect plug (2) with Profibus cable to Profibus card.

8. Mount ID7 PCB in the housing again and reattach all plugs and any interfaces.

in wall/panel unit
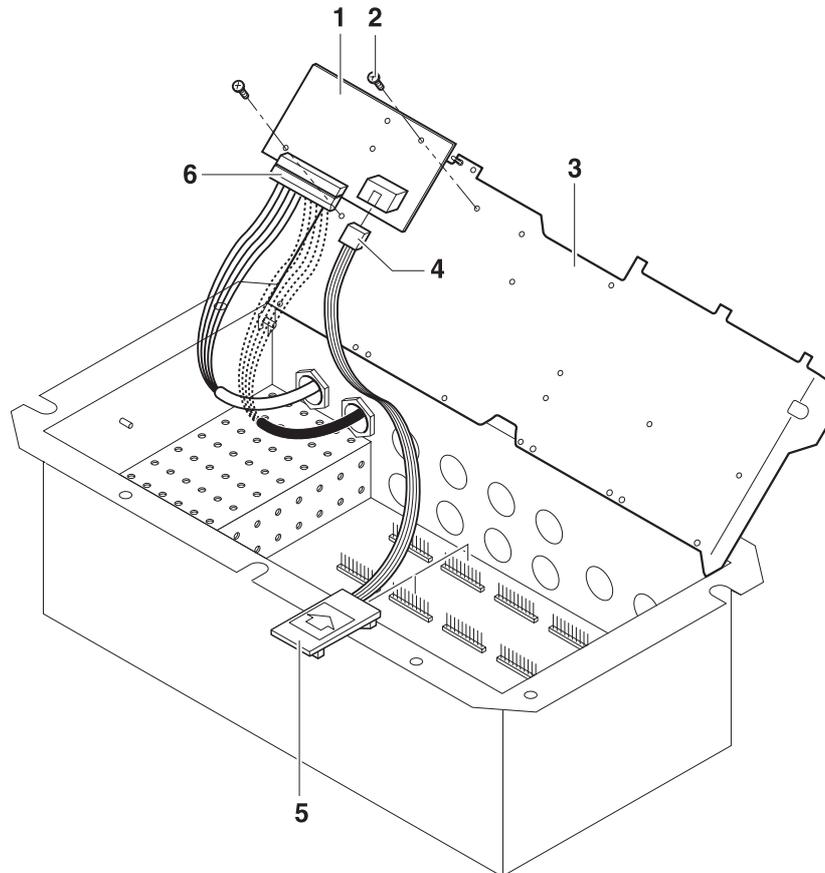
1. Secure the Profibus card (1) on the mounting plate (3) with 2 screws (2).

2. Insert plug (4) of ribbon cable in socket of Profibus card.

3. Insert PCB (5) in free slot of main PCB (COM2 ... COM6, preferably COM4). Ensure proper poling of PCB: Arrow on PCB must point toward holes for interface connections.

4. Connect plug (6) with Profibus cable to Profibus card.

1.4.4 Earthing

The ID7... weighing terminal must be installed non-isolated. For this purpose an bonding terminal is included in the delivery scope of the ID7... .

1. Mount the bonding terminal on the COM1 socket.

2. Connect the ID7... to the earth potential via the bonding terminal.

3. Connect all other devices participating on the Profibus-DP to the earth potential.

1.4.5   Diagnostic LEDs

The 4 diagnostic LEDs on the Profibus-DP-ID7 interface output the following states:

Yellow LED	Operating voltage switched on
Green LED	Profibus data cycles started
Red LED	Communication dialog faulty
Green LED	Sign of activity in secondary cycle

1.4.6   Setting matching resistor
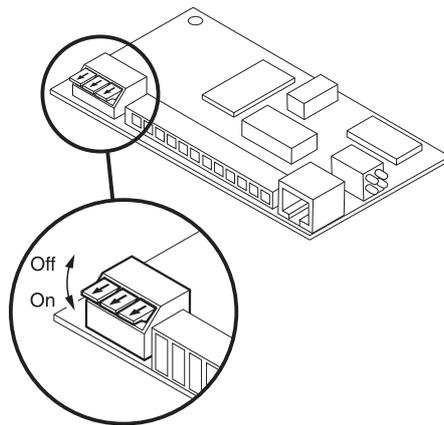
➜ If necessary, activate the matching resistor directly on the Profibus-DP-ID7 interface. To do this, set all dip switches to ON.

1.4.7   Closing ID7... weighing terminal

Closing desk unit

1. Lay the unit on cover and fix slightly in place with 3 screws.

2. Press the unit into cover so that 3 engaging springs engage.

3. Tighten screws.

CAUTION

The IP68 protection type can only be guaranteed when the weighing terminal is closed again properly.

➜ The 3 engaging springs must be completely engaged.

➜ Make sure that the keypad cable is not pinched.

Closing wall unit

1. Fold in the mounting plate.

2. Position the cover and screw on again. When doing so, make sure that no cables are pinched.

Closing panel unit

1. Fold in the mounting plate and position the cover on the cut-out again.

2. Secure the cover on the switch cabinet from the inside with 10 screws. When doing so, make sure that no cables are pinched.

2   Settings in master mode

2.1   Master mode block INTERFACE

Select interface connection   → Select the interface connection in the first block.

Select interface setting   → Select the setting PROFIBUS-DP for the selected interface connection.
If this setting is not offered, hardware and/or software must be updated on the weighing terminal. Please contact the METTLER TOLEDO Service for this purpose.

2.1.1   Configuring Profibus-DP-ID7

PROFIBUS-DP	Configuring Profibus-DP-ID7
NODE ADDRESS	Select desired node address in range 001 to 126. Factory setting: 126
OPERATING MODE	Set type and word length of user data parameter VALUE.
	Consistent over valid module pair in GSD file
16-BIT-INTEGER / 2 WORDS	2 words 16-BIT-INTEGER 2(+2)W AI 16-BIT-INTEGER 2(+2)W AO
16-BIT-INTEGER / 4 WORDS	2 words 16-BIT-INTEGER 2(+2)W AI (use 2x) 16-BIT-INTEGER 2(+2)W AO (use 2x)
32-BIT-FLOATING- POINT	4 words 32-BIT-FLOATING-POINT 4W AI 32-BIT-FLOATING-POINT 4W AO
SETPOINT MODE	Set type and use of setpoint.
UNIVERSAL	Each setpoint can be set and read independently of others.
CHECKWEIGHING	As soon as setpoints 1 and 2 are set, DeltaTrac CHECKWEIGHING will be activated with SP1 = setpoint and SP2 = tolerance (in %, in 16-bit integer mode with 2 decimal places). In read table current state BELOW (SP1), GOOD (SP2) or ABOVE (SP3) can be read off.
FILLING	As soon as setpoints 1 and 2 are set, DeltaTrac CHECKWEIGHING will be activated with SP1 = setpoint and SP2 = tolerance (in %, in 16-bit integer mode with 2 decimal places). In addition, SP3 and SP4 can also be loaded as any desired setpoints. In read table current state GOOD (SP1), ABOVE (SP2), SP3 REACHED (SP3) or SP4 REACHED (SP4) can be read off.

PROFIBUS-DP	Configuring Profibus-DP-ID7
INPUT MODE	Set request for identification data in Input mode. After setting the user data command INPUT MODE in the write table, the selected request for input is automatically carried out and the entries are saved in the application blocks 094 to 097. The user data response INPUT MODE RUNNING remains set while the input mode is active.
A	Code A is requested.
A+B	Code B and Code A are always requested.
A+B+C	Code C, Code B and Code A are always requested.
A+B+C+D	Code D, Code C, Code B and Code A are always requested.
EXP. AB AREA	Input of up to three expanded application blocks for constants which can be accessed when writing applications blocks. **Example** **Input** **enables access to** 021 application blocks 021_001 to 021_999 046 application blocks 046_001 to 046_999 071 application blocks 071_001 to 071_999
CONFIGURE INPUTS	Select the desired setting for every input. Factory setting for the ID7-Base: Input 1 not in use Input 2 zero setting Input 3 taring Input 4 entry (ENTER key) Input 5 … not in use Input 8
CONFIGURE OUTPUTS	Select the desired setting for every output. Factory setting for the ID7-Base: Output 1 Delta low Output 2 Delta ok Output 3 Delta high Output 4 Stable Output 5 Setpoint 1 Output 6 Setpoint 2 Output 7 Setpoint 3 Output 8 Setpoint 4
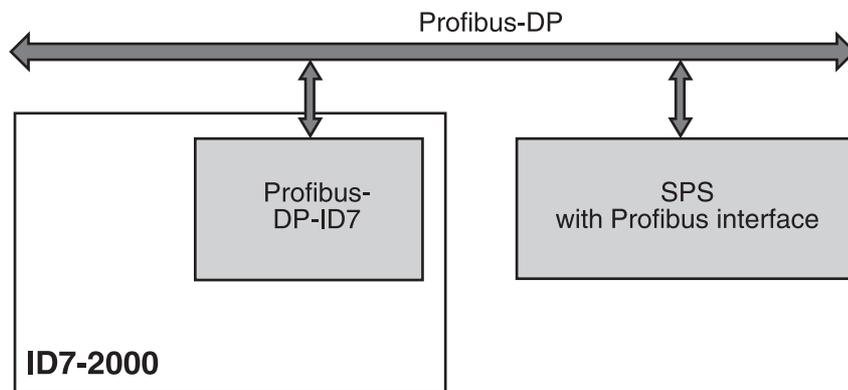
PROFIBUS-DP	Configuring Profibus-DP-ID7
| TEST MODE | Activation of the information display. In line 3 and 4 write and read tables are displayed as follows:<br><br>```
          3   4              5      6
         ┌──────────────────────────────┐
         │  TEST MODE              0.999 kg │
         │  Id    Val   5432109876543210  I/Os │
      2──│  00    0000  0000000010000000   00   00 │
      1──│  00    03E7  0100000000000000   08   00 │
         │            CANCEL              │
         └──────────────────────────────┘
```<br><br>**1**  Read table<br>**2**  Write table<br>**3**  Operating mode (internal)<br>**4**  Value (hexadecimal)<br>**5**  Command/response bits<br>**6**  Inputs/outputs (hexadecimal) |

3   Interface description

3.1   Profibus-DP communication with a PLC

3.1.1   Overview
The Profibus-DP-ID7 is designed for operation as a slave on the Profibus-DP. This provides the following possibilities with a master PLC also connected to the Profibus-DP:

• Access to the weight values of the weighing platform connected to the weighing terminal

• Operation of the weighing platforms connected to the weighing terminal (zero-set, taring, setting specified tare values, etc.)

• Triggering key presses, transmitting data strings or display of texts

3.1.2   Data formats
All user data are transmitted in a compressed, up to 4-word long format.

Write table   Format for transmitting user data from the PLC to the Profibus-DP-ID7.

Read table   Format for the transmission of user data from Profibus-DP-ID7 to the PLC.

Structure of the write and read table
The write and read table are similarly structured and contain the following sections:

• Value (16-bit integer or 32-bit floating point) for the transmission of weight values, application block numbers, etc.

• Commands or the corresponding responses with a total of 16 bits

• Control of 16 digital I/Os

3.1.3   Handshake

As certain commands can not always be executed immediately by the scale, e.g. taring with a restless weighing platform, 3 handshake bits of the PLC allow clear monitoring of the success of its commands:

1. The PLC starts a command by setting the corresponding command bit and also toggles COMMAND VALID in the write table. All other command bits are 0.

2. The weighing terminal responds with the current data of the read table. If it was possible to completely process the command, the COMMAND EXECUTED bit is toggled. Otherwise COMMAND EXECUTED remains unchanged.

3. The PLC recognises whether it can transmit the next command or must repeat the last one from COMMAND EXECUTED and transmits the write table to the weighing terminal.

4. The weighing terminal recognises from the status change of the COMMAND VALID bit that it should carry out the next command. In addition, the weighing terminal also detects whether the last command has been executed or is still running. If the PLC attempts to start new commands before the previous one has been confirmed by the weighing terminal with a status change of COMMAND VALID, the weighing terminal ignores this new command.

3.1.4 Commands and responses

All commands available to the PLC and the corresponding responses are shown in the following two tables.

Data direction PLC -> ID7   Write table

Data direction ID7 -> PLC   Read table

Write table

16-Bit Integer 2 Words	Word 0			Word 1			
16-Bit Integer 4 Words	**Word 0**			**Word 1**		**Word 2**	**Word 3**
32-Bit Floating Point		**Word 0**	**Word 1**	**Word 2**		**Word 3**	
Bit	**Value** 16-Bit	**Value** 32-Bit Floating Point		**Command**		**16 Digital I/O**	**AB data**
0		Mantissa	Mantissa	Command valid Toggle-bit for all commands		Setting of ID7 outputs or Displaying or evaluating inputs of external I/O module	Data for writing an application block Tolerance specifications are handled in % if the sign is set to 1.
1				Bits 1/2/3: Selection of read-table value, read/write AB			
2				0/0/0 = Display 1/0/0 = Net 0/0/1 = Key No. 1/0/1 = Read AB 0/1/0 = Gross 1/1/0 = Tare 0/1/1 = Write AB 1/1/1 = Not in use			
3							
4				Bits 4/5/6: Selection of write-table value			
5				0/0/0 = Empty 1/0/0 = Tare specification 0/0/1 = Setpoint 1 1/0/1 = Setpoint 2 0/1/0 = Key No. 1/1/0 = Fixed Text No. 0/1/1 = Setpoint 3 1/1/1 = Setpoint 4			
6							
7				Taring			
8			Exponent	Delete tare			
9				Set to zero			
10				ENTER key			
11				Input mode			
12				Switch keyboard on/off			
13				Reserved			
14				Bits 14/15: Selection of weighing platform			
15	Sign	Sign		0/0 = None 1/0 = Scale 1 0/1 = Scale 2 1/1 = Scale 3			Sign

Read table

16-Bit Integer 2 words	Word 0			Word 1			
16-Bit Integer 4 words	**Word 0**			**Word 1**		**Word 2**	**Word 3**
32-Bit Floating Point		**Word 0**	**Word 1**	**Word 2**		**Word 3**	
Bit	**Value** 16-Bit	**Value** 32-Bit Floating Point		**Command**		**16 Digital I/O**	**Not in Use**
0		Mantissa	Mantissa	Command executed Toggle-bit for all commands		Showing or reading of ID7 inputs or Displaying or setting outputs of external I/O module	
1				Error command			
2				Movement			
3				Net			
4				Error scale (overload/underload…)			
5				Key(s) was/were pressed			
6				Input mode active			
7		Exponent		Setpoint 1 reached			
8				Setpoint 2 reached			
9				Setpoint 3 reached			
10				Setpoint 4 reached			
11				1 = keyboard blocked, 0 = keyboard unblocked			
12				Reserved			
13				Reserved			
14				Bits 14/15: Current weighing platform 0/0 = None 1/0 = Scale 1			
15	Sign	Sign		0/1 = Scale 2 1/1 = Scale 3			

Notes on commands

If the command requires parameters, they will be transmitted either as an integer value or as a floating point value depending on the operating mode set.

Exception: The commands READ/WRITE APPLICATION BLOCK and PRESS KEY always expect integer values as parameters.

Read commands
- The read commands Display value, Net, Gross, Tare, Key and Application block overwrite the cyclically transmitted display values with the required data. The data are transmitted as 16-bit integers or 32-bit floating points. As soon as the COMMAND EXECUTED bit is toggled, these values must be evaluated immediately by the PLC, as in the next cycle the value in the read table is overwritten again with the current weight value.

- The response to the READ KEY NUMBER command (write table bits 1/2/3 = 0/0/1) is transmitted in the Word 0 (16-bit integer) or in Word 1 (32-bit floating point). The low byte contains the keyboard code, the high byte the function key code.
  The ID7 can store a maximum of 10 keys for being called via the READ KEY NUMBER command. If they are not called, the oldest key actuations are overwritten.
  After reading out the last stored key, the KEY WAS PRESSED bit is reset. The key memory is cleared after the device is switched on and after the mastermode is exited.

Reading and writing application blocks
- When writing an application block, the desired data are simultaneously transferred with Word 3. For this reason, writing application blocks is only possible in 16-bit integer/4-word mode.

- Only application blocks with the formats "numeric" or "weight value" can be read or written. When writing, certain tolerance (sub-)blocks (e.g. with DeltaTrac) can be intentionally written with the format "percent" by setting the sign to "1".

- If a non-existent block or an alphanumeric block is selected, the ID7 responds with ERROR COMMAND.
  The requested data are supplied in the 16-bit integer mode in the same format as the weight value, and in the 32-bit floating point mode floating point values are always transmitted.

The **application block number** in the write table must be entered as a value (Word 0 in 16-bit integer mode, Word 1 in 32-bit floating point mode) in the following format for the READ APPLICATION BLOCK and WRITE APPLICATION BLOCK commands:

"Basic" application block

	Sub-block no.				Exp.		Application block number									
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Example	S	S	S	S	E	E	A	A	A	A	A	A	A	A	A	A
AB 10	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
AB 20, sub-block 2	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0

Expanded application block

Condition
One or more expanded application blocks are selected in mastermode.

Example
Application block 21 is selected as the 1st expanded application block,
application block 46 is selected as the 2nd expanded application block.

	Sub-block no.				Exp.		Index of the expanded AB									
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Example	S	S	S	S	E	E	A	A	A	A	A	A	A	A	A	A
AB 21_007	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1
AB 46_005, SB 1	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1

Input of tolerances in %
If the sign (bit 15) in Word 3 is set to 1, tolerance specifications can be written accurately down to one decimal place in %.
This rule applies in the same way for Word 0 (16-bit integer) and Word 1 (32-bit floating point) when reading.

Example	Decimal	Binary															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
100.0 %	−1000	1	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0
1 %	−10	1	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0
0.1 %	−1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Write commands
- The write command PRESS KEY requires the low byte keyboard code and the high byte function key code as parameters.

- The function key code is based on the active function keys and must be correctly specified for each PRESS KEY command. A function key change can also automatically be forced by changing the function key code, e. g. from REF 10 (3301 hex) to X10 (0004 hex).

- The setpoints loaded via the WRITE SETPOINT X commands (e. g. Setpoint 1: write table bits 4/5/6 = 0/0/1) are deleted after switch-on and each time the mastermode is run. The Tolerance parameter in the setpoint modes Checking and Filling must be specified in the 16-bit integer mode with 2 decimal places, e.g. 1025 for 10.25 %.

Keyboard codes

Key	Code – Dec	Code – Hex	Key	Code – Dec	Code – Hex
Function key F1	1	01	Set to zero	14	0E
Function key F2	2	02	Taring	15	0F
Function key F3	3	03	Tare specification	16	10
Function key F4	4	04	Enter	17	11
Function key F5	5	05	Clear	18	12
Function key F6	6	06	ON/OFF	20	14
CODE A	7	07	+/−	31	1F
CODE B	8	08	. (Decimal)	46	2E
CODE C	9	09	Number key 0	48	30
CODE D	10	0A	Number key 1	49	31
Function change	11	0B	…	…	
Info	12	0C	Number key 9	57	39
Scale	13	0D			

Function key codes

Function key	Code – Dec	Code – Hex
Standard keys of ID7-Base	00	00
Extended tare keys of ID7-Base	02	02
Standard keys of Pac	51	33
Extended keys of Pac *	52	34
etc. *	…	…

* Only when the Pac is equipped with more than one function key page, i.e. more than 6 function keys.

Digital I/Os
The operating mode of an I/O interface (4 I/O-ID7 or a relay box 8-ID7) installed on the ID7 is dependent on where the I/Os are located (directly on the ID7 or externally on the Profibus) and on the parameters CONTROL INPUTS, CONTROL OUTPUTS.

	Outputs	**Inputs**
No I/Os on ID7	The ID7 controls external outputs via the read table.	The ID7 reads external inputs from the write table and executes predefined actions.
I/Os on ID7 (4 I/O-ID7 or 8-ID7 relay box), inputs and outputs configured to CONTROL INTERNAL	The ID7 controls internal outputs and displays these in the read table.	The ID7 reads internal inputs and executes predefined actions; the PLC has no access.
I/Os on ID7 (4 I/O-ID7 or 8-ID7 relay box), inputs and outputs configured to CONTROL EXTERNAL	The PLC controls the outputs of the ID7 via the write table.	The ID7 reads internal inputs and displays these in the read table.

3.1.5 Messages in display
The following messages may appear briefly in the display:

Message	**Meaning**
PROFIBUS NOT ACTIVE!	• Initialisation processes are still running on Profibus-DP. • The ID7 is not yet connected to the Profibus-DP.
PROFIBUS ACTIVE	• Readiness restored, e.g. after switch-on, exiting mastermode or following a bus interruption.
PROFIBUS – ERROR BCC RX PROFIBUS – ERROR BCC TX	• ID7 or field bus module have detected a BCC error.
PROFIBUS – ERROR DATA RX PROFIBUS – ERROR DATA TX	• Communication error ID7 <–> Field bus module: e.g. not ETX, Uart error, etc.
PROFIBUS – TIMEOUT ID7	• Communication error ID7 <–> Field bus module: The ID7 does not respond within the defined time.
PROFIBUS – ERROR CONF.	• The field bus module has not received the configuration data properly.

3.1.6   GSD file

The GSD file required for communication with the Profibus-DP-ID7 is available from METTLER TOLEDO Service or can be downloaded from the Profibus GSD Library at **http://www.profibus.com**.

3.1.7   Profibus DP-ID7 demo kit

For a demonstration and test of all commands with a normal PC, ask METTLER TOLEDO Customer Service for the Profibus DP-ID7 demo kit.

4   Technical data

Profibus-DP-ID7 field bus module	
Connection to field bus	• RS485-DP connection via removable Mini-Combicon terminal bar
	• 2 EMC cable entry fittings for incoming or outgoing field bus cable with a diameter of 7 − 10 mm
	• When installing in ID7xx, ensure a strain relief ≥ 100 N.
Baud rate	Up to 12 Mbit/s
Matching resistor	Connectable via 3 DIP switches
Node address	Adjustable to between 001 and 126 in mastermode Factory setting: 126
Date width	2/4 IN and 2/4 OUT words, consistent for 2 words with operating mode 16-bit integer or for 4 words with operating mode 32-bit floating point
Status displays	• 4 status LEDs provide information on operating state
	• Test operation shows user data on display
Supported Profibus version	DP-V0

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