

DIS2116

Scale electronics
(NAWI)



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Typographical conventions

For clear identification and improved legibility, the following conventions have been used in this documentation:

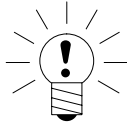


NOTE

Important paragraphs are marked with a symbol to draw attention to them.

<i>Italics</i>	Indicates external documents and files
"MODE"	All menus and menu commands appear in quotes, here the main menu "MODE".
"ENTER"	Quotes and italics are used for keys, input fields and user input.
TAR	Bold is used for communication commands.
<u>Er1250</u>	Underlined normal print is used for error messages.

Important information



NOTE

Neither the design of the device nor any technical safety aspects may be modified without the express permission of Hottinger Baldwin Messtechnik GmbH. Any modification excludes Hottinger Baldwin Messtechnik GmbH from any and all liability for any damage resulting therefrom.

When replacing the battery for the real-time clock, the device must be disconnected from the power supply (service life \geq 5 years).

It is strictly forbidden to carry out any repairs and soldering work on the motherboards or to replace any components. Repairs may only be carried out by persons authorized by Hottinger Baldwin Messtechnik GmbH.

The production number set at the factory cannot be changed.

When connecting the cables, the device must be disconnected from the voltage supply.

Safety instructions

- There are not normally any hazards associated with the product, provided the notes and instructions for project planning, installation, appropriate operation and maintenance are observed.
- It is essential to comply with the safety and accident prevention regulations specific to the particular application.
- Installation and start-up must only be carried out by suitably qualified personnel.
- Do not allow damp and dirt to get inside the device when connecting the cables.
- When connecting the cables, take action to prevent electrostatic discharge as this may damage the electronics.
- The required power supply for the device is an extra-low voltage (10...30 V) with safe disconnection from the mains.
- When connecting additional devices, comply with the safety requirements.
- The ground connections of the supply voltage, the interface and the load cell cable shield are interconnected in the device. If the potentials of the devices to be connected are different, suitable steps must be taken to isolate the signals (such as using an optocoupler).
- Shielded cables must be used for all connections apart from the supply voltage (see note below). The shield must be connected to the provided terminals (Chapter 5.3, page 18).
- The use of unshielded cables for the voltage supply is only permissible for cables with a maximum length of 30 m, laid inside buildings. If cables are longer or are installed outside buildings, shielded cables must be used (as per EN 61326-1).
- To compensate for potential differences, the metal housing of the DIS2116 must be connected to the scale structures as well as to the ground potential of the connected devices by a low-resistance equalizing conductor. This is unnecessary if a potential difference of 35 V is not exceeded.
- In the device, the reference ground (GND) of all the signals and the supply voltage is connected directly to the cable shield connection but not to the housing.
- Connection to a wide-ranging supply network is not permitted as this often causes interfering voltage peaks to be coupled into the electronics. Instead, a local supply must be provided for the DIS2116 (even when grouped).
- The front foil is made from high-quality materials, providing a service life appropriate to the external conditions. The keys must only be operated by hand; under no circumstances must pointed objects be used to press them.

1 Introduction and appropriate use

This User Manual contains detailed information both on operation and on the setting options of the DIS2116 scale electronics.

The DIS2116 is designed for use in industrial applications, for example

- as a legal-for-trade main display for up to 24 digital load cells (e.g. C16i) as components of a non-automatic scale (NAWI) ¹⁾
- as a vehicle scale with max. 3 segments as a compound weighing machine

Use for any purpose other than the above is deemed to be inappropriate.

In the case of legal-for-trade use, national legal and safety regulations must be complied with.

1) NAWI – non automatic weighing instrument

2 Special features

The DIS2116 is a digital display unit for connection to digital load cells.

The DIS2116 has available:

- RS485 4-wire connection for up to 24 digital load cells
- Menu for a vehicle scale with up to 3 segments and max. 8 load cells per segment
- Encrypted transmission of measured values between DIS2116 and load cells in legal-for-trade mode
- COM port for serial communication with a PC / PLC (RS232)
- COM port for a printer (RS232 or USB)
- COM port for external large-scale display (RS232)
- COM port for connection to fieldbuses
- PS2 connection for external keyboard
- Internal SD card as alibi memory for print data and settings
- Real-time clock with battery buffering
- Supply voltage range 10...30 V_{DC}
- Voltage output for supply of digital load cells

The electronics are set and parameterized via keyboard or interface.

Additional features:

- Use as 1, 2 or 3-range scale
- Disabling/enabling of menu functions
- Filter selection
- Max. capacity adjustment, partial load adjustment
- Zero on start-up
- Automatic zero tracking
- Weighing range linearization
- Different print functions
- Numerous monitoring and error detection functions

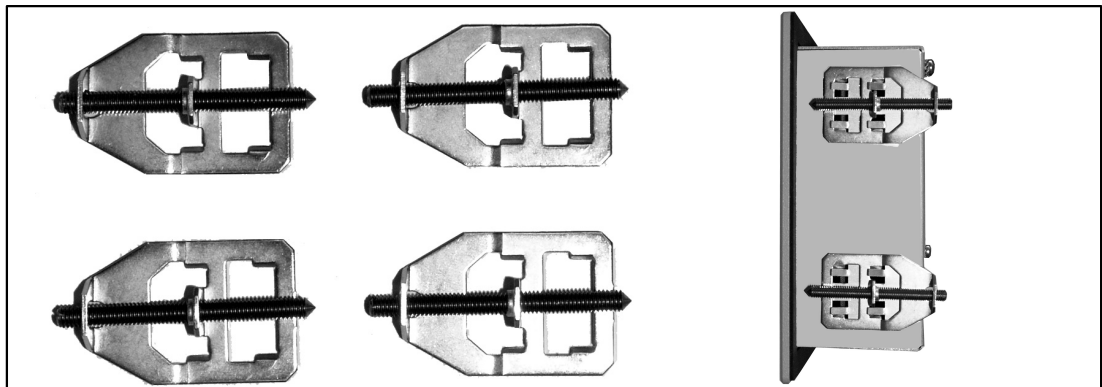
3 Mechanical construction and scope of supply

3.1 Scope of supply



Fig. 3.1: DIS2116 view

- DIS2116 scale electronics in **aluminum housing** for panel mounting
- Adhesive label for closing and sealing the opening for the calibration pushbutton and labeling strips
- 8 labeling strips for creating the scale type plate
- 2 8-pin mating connectors (Phoenix Mini-Combicon mating connector 8 pin Type: MC1.5/8-ST-3.81)
- 2 connector housing with strain relief (Phoenix Mini-Combicon connector housing 8 pin Type: KGG-MC 1.5/9)
- 4 mounting elements for panel mounting



For DIS2116 panel mounting, the cut guides are bent outward for fitting the mounting elements. Then, the set screws are used for clamping the housing to the panel.

- SD card (1 Gbyte) installed in DIS2116
- Quick start guide
- System CD, 1-DIS2116-DOC

3.2 Accessories, to be ordered separately

- Power pack, AC/DC 15 V / 530 mA (for max. 8 load cells)
- Desktop housing, also for wall mounting, 1-TG2116 (for Dimensions see Chap. 22.2, page 116)
- Junction box VKD2R-8
- Cable (connection cable for C16i)

4 Scale commissioning overview

The permissible supply voltage for the DIS2116 is in the range of +10 ...30 V_{DC} and must be adequately smoothed (rms value less residual ripple >10 V).



NOTE

When the digital load cells, e.g. C16i, are supplied via the DIS2116, the permissible supply voltage is +10 ... 17 V_{DC}.

A 100...240 V power supply unit is available as an accessory (AC/DC15 V / 530 mA, for max. 8 load cells). This is suitable for all digital load cells.

When properly connected with shielded cables, the DIS2116 complies with the relevant European standards and carries the CE mark.

A formatted SD card with the parameters of the factory setting is inserted in the device.

Mechanical dimensions are described in chapter 22 (page 115) and mounting information in chapter 3, page 12 .

Subsequent sub-chapters provide an overview of the sequence of steps that need to be taken to commission the scale, depending on the application:

- Initial commissioning
- As a component of a non-automatic scale (NAWI¹⁾) → Chapter 4.2 (page 15)
- As a component of a vehicle scale → Chapter 4.3 (page 16)

This overview includes information on the respective chapters in this Manual.

1) NAWI – non automatic weighing instrument

4.1 Initial commissioning

- Mounting the device, Chapter 3 (page 12)
- Connecting the digital load cell(s), Chapter 5 (page 17) and 5.4 (page 21)
- Connecting the supply voltage, Chapter 5 (page 17) and 5.5 (page 21)
- Connecting the serial connections, Chapter 5 (page 17), 5.8 (page 24) or 5.9 (page 25)
- Switching on the device, Chapter 7.1 (page 30)
- Configuration of the load cells, Chapter 10.1 (page 66)

4.2 NAWI application

- Mounting the device, Chapter 3 (page 12)
- Connecting the digital load cell(s), Chapter 5 (page 17) and 5.4 (page 21)
- Connecting the supply voltage, Chapter 5 (page 17) and 5.5 (page 21)
- Connecting the serial connections, Chapter 5 (page 17), 5.8 (page 24) or 5.9 (page 25)
- Switching on the device, Chapter 7.1 (page 30)
- Calling the parameter menu via the hidden key, Chapter 8 (page 36)
- Enabling all menu functions, Chapter 8.5.11. (page 55)
- Configuration of the load cells, Chapter 10.1 (page 66)
- Setting the weighing range, Chapter 8.5.13. (page 58)
- Setting the correct filters, Chapter 9 (page 65)
- Adjusting the weighing range, Chapter 10 (page 66)
- Digital off-center load compensation (if necessary), Chapter 10.6 (page 72)
- Linearization (only when necessary), Chapter 11 (page 81)
- Settings for legal-for-trade applications, Chapter 12 (page 83)
- Parameter settings for serial interfaces, Chapter 8.5.5. (page 45), 15 (page 96) or 16 (page 99)
- Setting the date and time, Chapter 8.5.7. (page 49)
- Disabling menu functions (if necessary), Chapter 8.5.11. (page 55)
- Filling out the labeling strip, securing the labeling strip, Chapter 12 (page 83)
- Checking settings and functions

4.3 NAWI application (vehicle scale)

- Mounting the device, Chapter 3 (page 12)
- Connecting the load cell(s), Chapter 5 (page 17) and 5.4 (page 21)
- Connecting the supply voltage, Chapter 5 (page 17) and 5.5 (page 21)
- Connecting the serial connections, Chapter 5 (page 17), 5.8 (page 24) or 5.9 (page 25)
- Switching on the device, Chapter 7.1 (page 30)
- Calling the parameter menu via the hidden key, Chapter 8 (page 36)
- Enabling all menu functions, Chapter 8.5.11. (page 55)
- Configuration of the load cells, Chapter 10.1 (page 66)
- Setting the weighing range, Chapter 8.5.13. (page 58)
- Setting the correct filters, Chapter 9 (page 65)
- Adjusting the weighing range, Chapter 10 (page 66)
- Digital off-center load compensation (if necessary), Chapter 10.6 (page 72)
- Linearization (only when necessary), Chapter 11 (page 81)
- Setting the vehicle scale function, Chapter 13 (page 86)
- Setting parameters for the serial interfaces, Chapter 8.5.5. (page 45), 15 (page 96) or 16 (page 99)
- Setting the date and time, Chapter 8.5.7. (page 49)
- Disabling menu functions (if necessary), Chapter 8.5.11. (page 55)
- Filling out the labeling strip, securing the labeling strip, Chapter 12 (page 83)
- Checking settings and functions

5 Electrical connections

5.1 Notes

Please observe the safety information at the start of this description.

The load cells and the supply cables are connected by means of screw terminals on the back of the device. The terminals are fitted with wire protection and the use of end sleeves is recommended, particularly for the load cell cables. The assignment of the connection terminals is displayed on the back of the device.



NOTE

All the ground connections are interconnected on the motherboard!

5.2 Cable connection

All connections are accessible from the outside, the housing does not need to be opened. Strain relief for the connection cable can be implemented via the supplied terminal housing. It permits the use of round cables with a diameter of 5...7 mm.

To minimize EMC problems, the individual wires from the end of the shielding to the terminal should be as short as possible.

The cable shieldings must be twisted together and connected to one of the terminals 1.1, 1.8, 2.1 or 2.8.

5.3 Cable preparation

- Remove the outer sheath about 20 mm.
- Twist braided shield.
- If necessary, remove the inner sheath.
- Strip the wire ends about 5 mm.
- Connect the wires to the terminals.

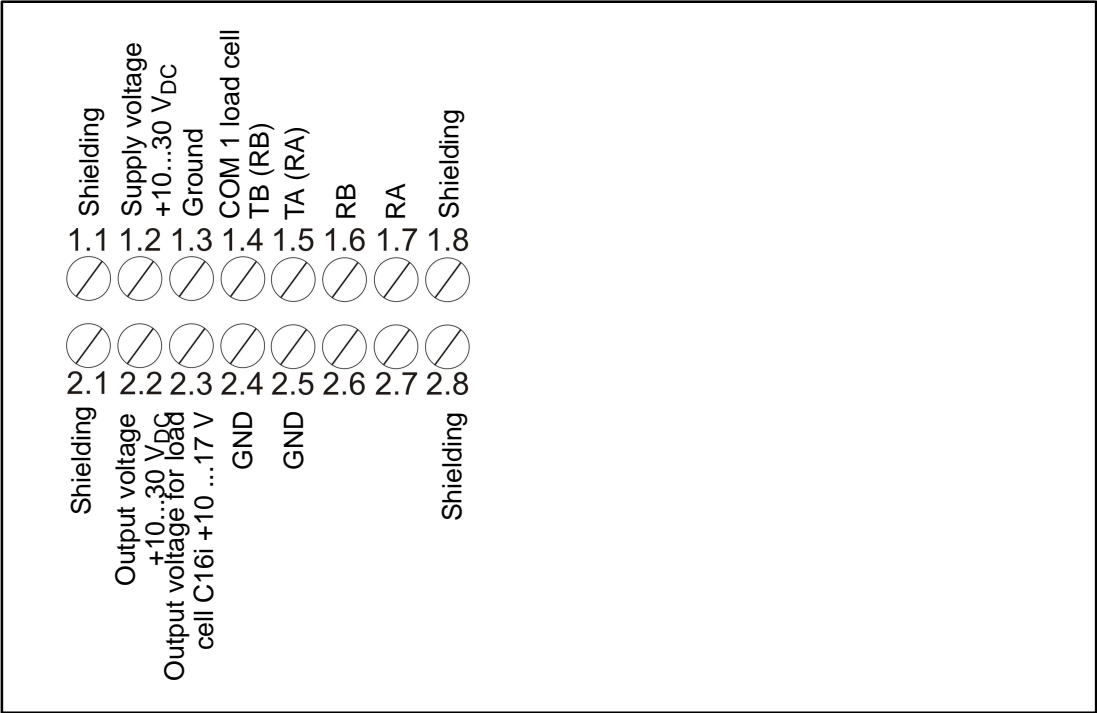
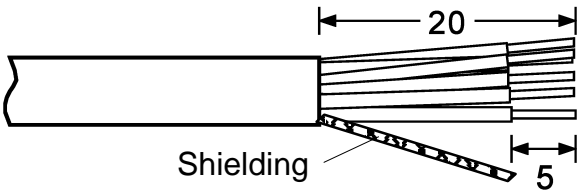


Fig. 5.1: Position of connections on terminal block K1

5.3.1. Connecting DIS2116 with C16i

C16i Cable core colours	RS-485-4 wire	DIS2116 Clamp K1
	Screen connection	1.1
Blue	RS-485, transmitting line A (=T-)	1.7 RA (RX-)
Black	RS-485, transmitting line B (=T+)	1.6 RB (RX+)
Green	RS-485, receiving line A (=R-)	1.5 TA (TX-)
Gray	RS-485, receiving line B (=R+)	1.4 TB (TX+)
White	Power supply ground	2.4 GND
Red	Power supply +, max. 17 V _{DC}	2.3 UB

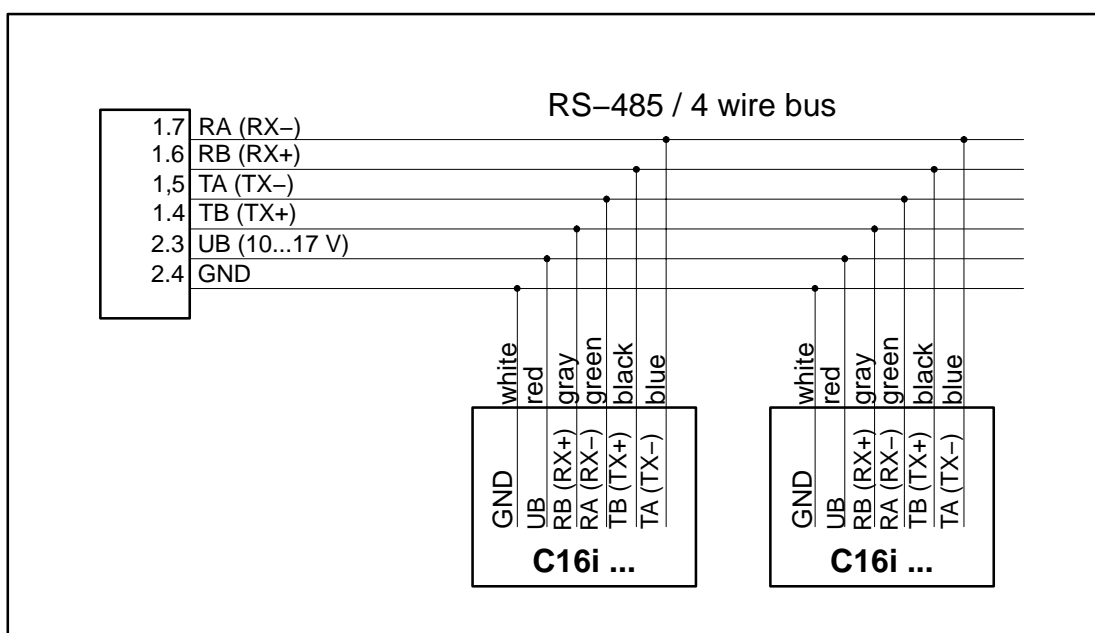


Fig. 5.2: Cable assignment

5.3.2. Connecting VKD2R-8 with DIS2116 and C16i

VK...	RS-485-4 wire	VK...	DIS2116
(input, signals from C16i)		(output)	(Clamp K1)
	screen connection	screen	1.1
TA	RS-485, transmitting line A (=T-)	TA	1.7 (RA)
TB	RS-485, transmitting line B (=T+)	TB	1.6 (RB)
RA	RS-485, receiving line A (=R-)	RA	1.5 (TA)
RB	RS-485, receiving line B (=R+)	RB	1.4 (TB)
GND	Power supply ground	GND	2.4
UB	Power supply +, max. 17 V _{DC}	UB	2.3

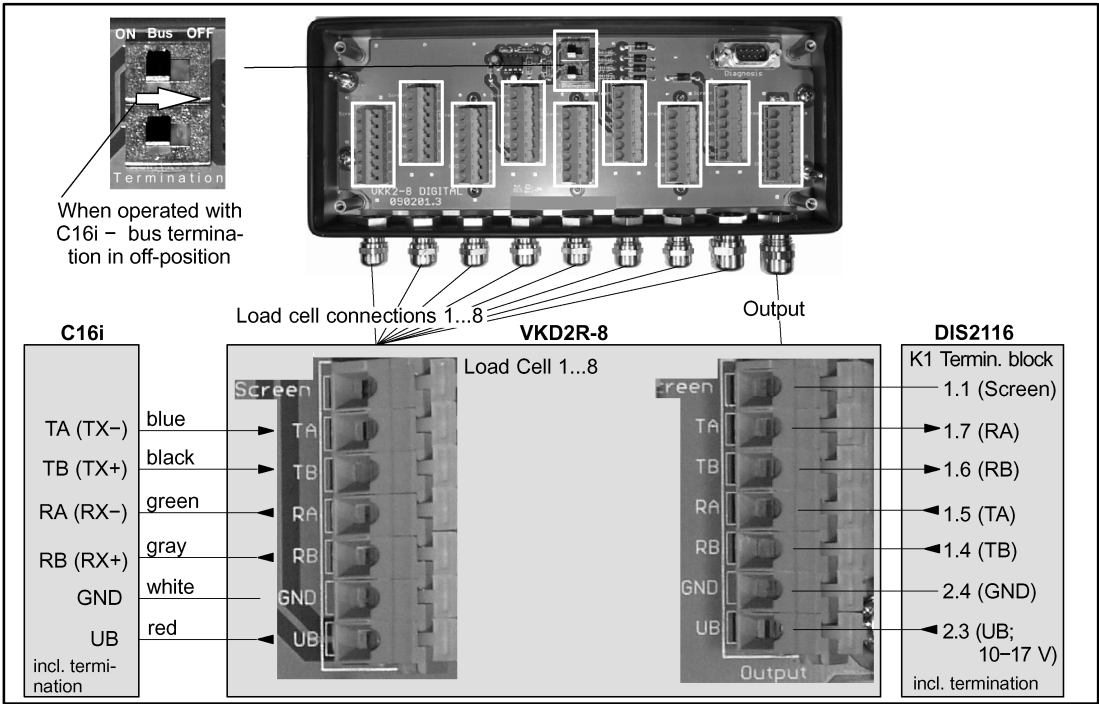


Fig. 5.3: Following the scheme of measuring chain C16i – VKD2R-8 – DIS2116

5.4 Load cell connection

Digital load cells e.g. C16i, can be connected to the DIS2116. An RS485 interface is available for this purpose.

The RS485 interface can be used as a 4-wire (full duplex) or as a 2-wire (half duplex) interface.

All digital load cells (e.g. C16i) have the address 31 as the factory setting. If several load cells are connected to a scale, the load cell addresses must first be changed. This setting is implemented in the parameter menu "SCALE CONFIGURATION" (Chapter 10.1, page 66)



NOTE

Call up the parameter menu "SCALE CONFIGURATION" after connecting the load cells.


5.5 Supply voltage

Terminal	Function	Comments
1.2	Supply voltage	+10...30 V _{DC} ¹⁾
1.3	Ground	

¹⁾ The supply voltage must be sufficiently filtered (rms value minus residual ripple > 10V).

5.6 Voltage outputs

Terminal	Function	Comments
2.2	Output voltage 10 ... 30 V	The input voltage 10 ...30 V is made available directly at the output to supply digital load cells
2.4	GND	Ground

2.3	Output voltage 10 ... 17 V	<div><div>NOTE This output is used to supply C16i load cells with a maximum supply voltage of 17 V. The input voltage is made available at the output up to a value of 17 V. The output is switched off at higher input voltages.</div></div>
2.5	GND	Ground
1.1, 1.8, 2.1, 2.8	Shielding	

5.7 RS485 interface (Terminal block K1)

The DIS2116 is the master for the connection with the digital load cells (C16i, measurement chain).

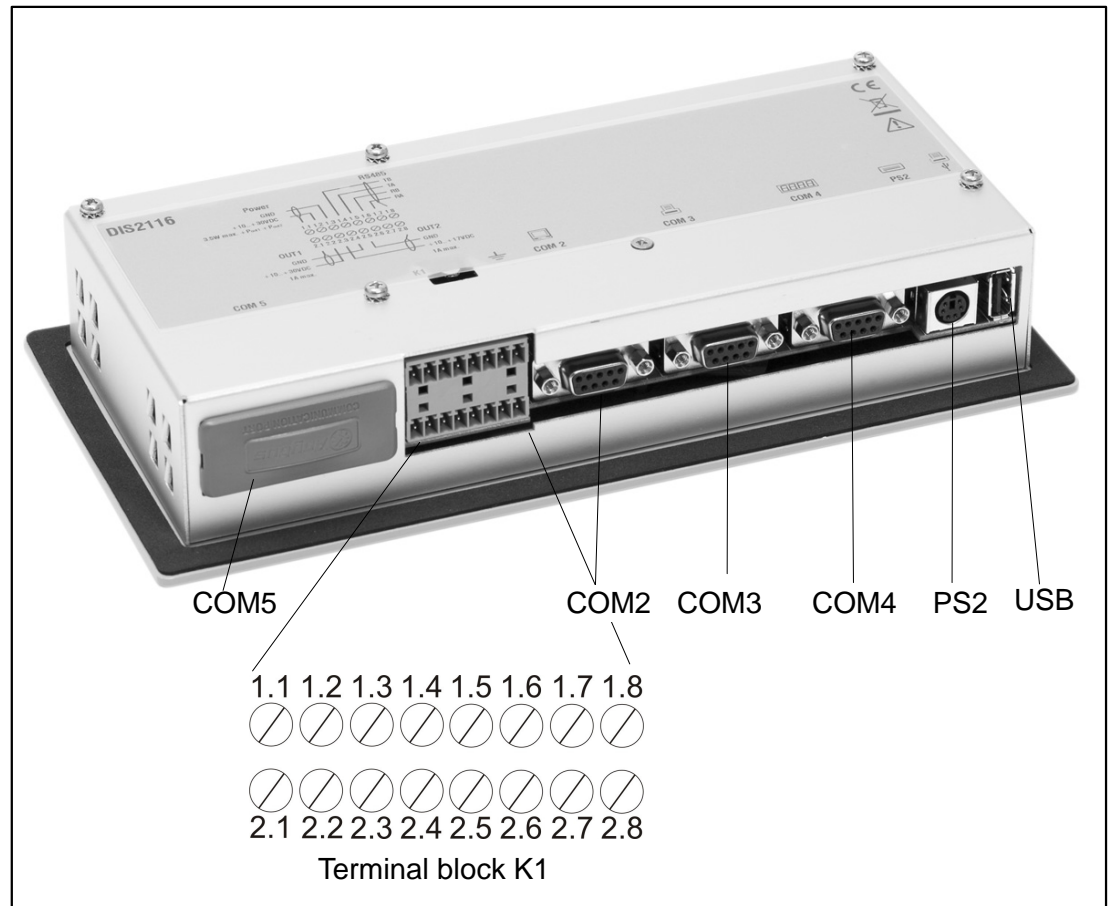



Fig. 5.4: Connection positions (back of device); assignment, see page 24

5.8 Terminal block K1 assignments

The terminal block K1 has the following signals:

- Supply voltage input
- Supply voltage load cell output
- RS485 4–wire load cell interface
- CAN load cell interface (dependent on load cell) for future applications

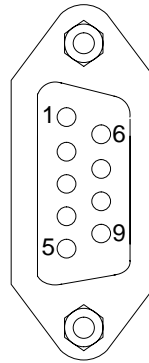
Terminal	Signal			Comments
1.1,1.8 2.1,2.8	Shielding			
1.2	Supply voltage	10...30 V		
1.3	Supply voltage	GND		
1.4	COM1 load cell		TB (RB)	Serial interface RS485 Only the terminals 1.4 and 1.5 must be used for RS485 2–wire
1.5	COM1 load cell		TA (RA)	
1.6	COM1 load cell		RB	
1.7	COM1 load cell		RA	
2.2	Voltage output	10...30 V		Output voltage = input voltage
2.3	 NOTE Voltage output supply C16i	10...17 V		With input voltage > 17 V this output does not supply voltage
2.4, 2.5	Voltage output	GND		
2.6	COM1 load cell		CAN_low	CAN interface
2.7	COM1 load cell		CAN_high	

5.9 RS232 interface (COM2)

COM2 computer interface for connection to a PC via SUB-D 9-pin socket

The SUB-D socket is assigned so that a standard RS-232 cable can be used.

- 1
- 2 RS232-TX
- 3 RS232-RX
- 4
- 5 0 V
- 6
- 7
- 8
- 9

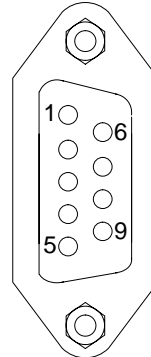


5.10 RS232 interface (COM3)

COM3 printer interface for connection of a serial printer via SUB-D 9-pin socket.

The SUB-D socket is assigned so that a standard printer cable can be used.

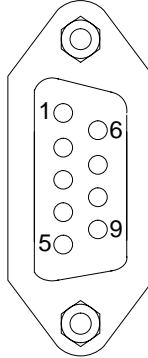
- 1 ---
- 2 RS-232-TX
- 3 RS-232-RX
- 4 DSR (DTR from printer)
- 5 0 V
- 6
- 7
- 8
- 9



5.11 RS232 interface (COM4)

COM4 interface for connection of a second display via SUB-D 9-pin socket. The SUB-D socket has the PC standard assignment.

- 1 ---
- 2 RS232-TX
- 3 RS232-RX
- 4 DSR (DTR from second display)
- 5 0 V
- 6
- 7
- 8
- 9



5.12 PS2 keyboard interface

PS/2

Input for connection of an external standard keyboard.

5.13 USB printer interface

USB host socket for connection of a printer.

5.14 Interface (COM5)

COM5 is set up as an optional interface for a fieldbus module.

The function and assignment is described together with the Anybus plug-in module.

6 Control and display functions

6.1 Device view

The front of the DIS2116 consists of the following elements:

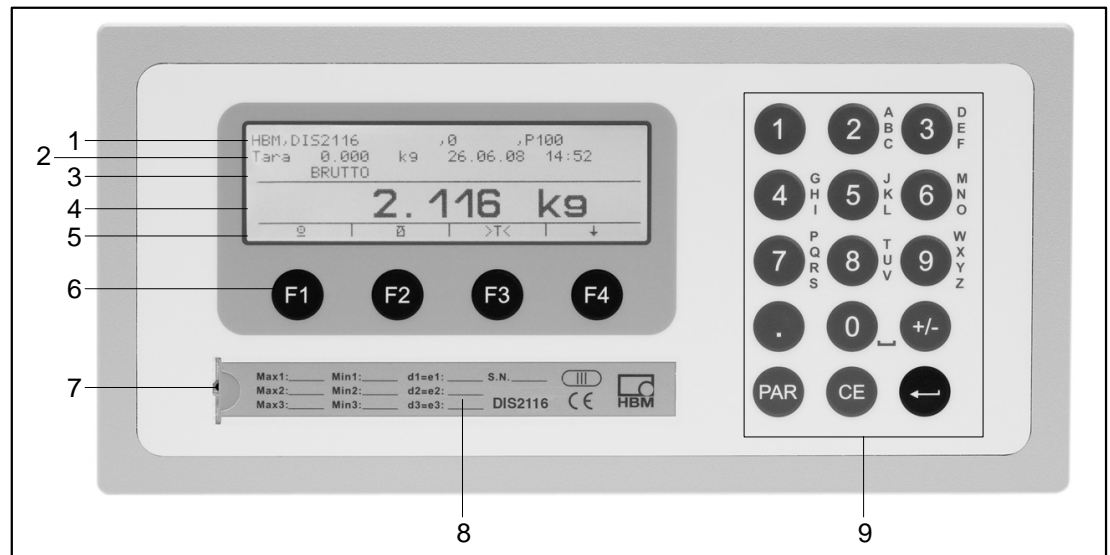





Fig. 6.1: DIS2116 front panel

1. Info line 1; configurable in the menu "Display → Display line 1"
2. Info line 2; configurable in the menu "Display → Display line 2"
3. Measurement status display
4. Measurement value display
5. Function line (meaning of function keys F1 ...F4)
6. Function keys F1 ... F4
7. Hidden pushbutton for access to the calibration menu. The pushbutton can be accessed with a pointed object (when the label is removed). After calibration, the opening is sealed with the enclosed adhesive label or, for legal-for-trade applications, with the calibration label. Device calibration is protected during operation and can only be changed when this pushbutton is actuated.
8. Inspection window for inserting a labeling strip (for scale type plate with calibration data, device name, etc.).
9. Keyboard for entering numbers and letters

The connections for serial interfaces and the terminals for the connection cables are located on the back of the device.

6.2 Operator controls

- Key  = Open parameter menu
- Key  = Cancel input, leave parameter menu without accepting changes
- Key  = Accept input or setting and quit dialog
- Keys F1...F4 = The function of the keys is displayed by the text or the symbols in the function line (Fig. 6.2) in the display
- Hidden pushbutton for access to the calibration menu (see Fig. 6.1).

6.3 Display

The display consists of the following elements:

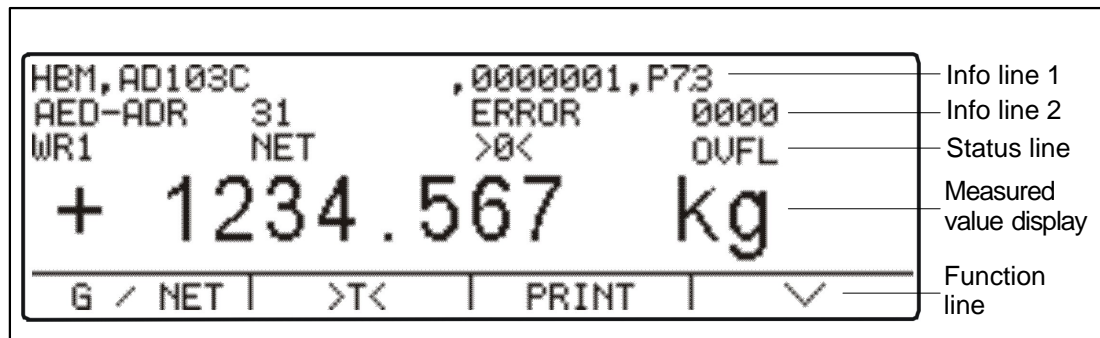


Fig. 6.2: Display


Info line 1 and Info line 2

The content of Info lines 1 and 2 can be set by the user.

(Menu "DISPLAY→ DISPLAY LINE1" or "DISPLAY → DISPLAY LINE2")

Status line

The status line is divided into 6 horizontal segments. The following symbols or texts are displayed, where applicable:

- WR1 ... WR3: Displays the currently valid weighing range.
WR is not shown with just one weighing range
- GROSS, NET, NET PT Indicates whether a gross measured value, net measured value or a net measured value where a manual tare is calculated, will be displayed
- >0< Displayed when the measured value is $0 \pm 0.25d$ (true zero).
-  1,2 Displays the overshoot of the set limit value 1 and / or 2
- OVFL Overflow is displayed when at least one load cell or the entire scale is loaded with more than 160 % of its maximum capacity
- x10 10-fold resolution switched on

Measurement display

- The weight value is displayed with \pm 7 digits with decimal point
- The physical unit is displayed with max. 4 characters

Display illumination

The LCD backlighting is always on once the power is connected


Display contrast

The LCD display contrast can be set in the menu "DISPLAY → CONTRAST" in 21 stages from -10 to +10. The lowest contrast is -10 and the highest +10.

7 Basic scale functions

All device functions can be controlled in one or more of the following ways:

- Front control with 19 short-stroke keys. With the function keys F1 ... F4, the meaning of the keys is displayed in the display function line.
- An external keyboard which can be connected via the PS2 input
- Connecting an external computer via the COM2 serial interface

The main scale functions (Gross/Net, Taring, Zero setting) are controlled via the function keys F1...F4. For calibration and further device settings a menu is called up with the key  (or F5 on the external keyboard) . Scale operation is not interrupted during parameter input, right up to exiting the menu. When computer commands are used for control, measurement generally continues without interruption. The exceptions to this are settling after filter selection and power failsafe storage to the EEPROM.

7.1 Switching on and off

The device is switched on once the supply voltage is applied.

When the electronics are switched on, a BUS-SCAN is executed initially, i.e. a check is made as to whether the load cells listed in the PARAMETER MENU – SCALE CONFIGURATION are present.

During initial commissioning, all digital load cells have the same address 31 (factory setting). The load cells must be configured, before a scale adjustment can be carried out.

With verified scales, a check is made as to whether the parameters in the load cells have been changed. If the parameters in the load cells are no longer identical to those during verification, an error message is displayed and no measured values.

Connected load cells that are not entered in the "PARAMETER MENU → SCALE CONFIGURATION" are not taken into account.

During the BUS-SCAN:

- **Information line 1** displays an identification string consisting of the manufacturer, TYPE, serial number and software version
- **Information line 2** displays date and time
- **Measured value status line** displays the legal-for-trade counter status (TCR) and whether the scale is legal for trade (LFT)

Zero is automatically set during initialization if this function is activated.

The actions carried out during initialization are displayed in clear text in the measured value display and the initialization progress is shown by a moving bar.

The scale must not be loaded before it is switched on.

The device is switched off by disconnecting the supply voltage from DIS2116.

7.2 Zero setting the scale

Press the F4 key until the symbol >0< appears above the F3 key.

Press the F3 key to set the measurement value to zero.

The displayed gross value is zero immediately after zero setting.

MODE → LEGAL-FOR-TRADE	Range of zero setting, lower limit	Range of zero setting, upper limit
NO (not legal for trade)	– 20 %	+ 20 %
OIML, NTEP	– 2 %	+ 2 %

The % figures relate to the nominal weighing range (parameter "SCALE PARAMETERS → PARAMETER → NOMINAL VALUE")

Execution is dependent on standstill recognition (Chapter 7.9, page 35).


The net display is deactivated.



NOTE

Zero setting is only possible when the function in the "PARAMETER MENU → FUNCTION KEYS → ZERO SETTING" is set to ACTIVE.

7.3 Gross/net selection

Press the F4 key until the symbol  appears above the F2 key.

Every time the F2 key is pressed, the display changes between gross and net. When selecting the net display, the last valid tare value is used again.



NOTE

Gross/net selection is only possible when the function in the "PARAMETER MENU → FUNCTION KEYS → GROSS/NET" is set to ACTIVE.

7.4 10-fold resolution

Press the F4 key until the display symbol x10 appears above the F2 key.

Every time the F2 key is pressed, 10x resolution is switched on/off. This mode can be used for test purposes. The measured value is then displayed with a factor 10 higher resolution.



NOTE

10-fold resolution is only possible when the function in the "PARAMETER MENU → FUNCTION KEYS → 10-FOLD RESOLUTION" is set to ACTIVE. If the scale is set to legal-for-trade OIML or NTEP, 10-fold resolution can only be switched on while the F2 key is pressed. When F2 is released, 10-fold resolution is switched off after 5 s.

7.5 Taring

Press the F4 key until the symbol >T< appears above the F3 key.

Pressing the F3 key stores the current gross value and deducts it from all the subsequent weight values. The displayed (net) value is zero immediately after taring. The tare value can be permanently displayed in the measurement value display, the setting must be made in the menu "DISPLAY-DISPLAY-LINE1" or "DISPLAY-DISPLAY-LINE2". The tare value can be read in the "INFORMATION-TARE VALUE" menu item.

MODE → LEGAL-FOR-TRADE	Tare range, lower limit	Tare range, upper limit
NO (not legal for trade)	-100 %	100 %
OIML, NTEP	>0	100 %

The % figures relate to the nominal weighing range (parameter "SCALE PARAMETERS → PARAMETER → NOMINAL VALUE")

Execution is dependent on standstill recognition (Chapter 7.9, page 35).

Taring with this key overwrites any manual tare value that may have been entered previously (PT symbol is switched off).

Entering manual tare value

Pressing the F3 key for more than 2 s displays a window for input of a manual tare value. Upon entry of a manual tare value, the net value plus manual tare is displayed (NET PT).



NOTE

Taring and entry of a manual tare value is only possible when the function in the "PARAMETER MENU → FUNCTION KEYS → TARING" is set to ACTIVE.

7.6 Manual tare function

A manual tare value can be input in the parameter menu "SCALE PARAMETERS-PARAMETER-MANUAL TARE VALUE" and the calculation of the manual tare value can be switched on/off in the parameter menu "SCALE PARAMETERS-PARAMETER-MANUAL TARE MODE", (see Chapter 8.5.8. (page 50) and 13 (page 86)).

When the "Manual tare" function is active, the net value is formed by deducting a fixed tare value.

The "G/N" key does not change the entered manual tare value.

The PT symbol in the display indicates that the net value has been formed by deducting the manual tare value. This disappears after taring with the key F3 (">T<").

If the tare function was activated, it will also be activated once the device is switched back on.

7.7 Zero on start-up

If this function is activated (parameter menu "SCALE PARAMETERS → PARAMETER → ZERO ON START-UP"), the unloaded scale is automatically set to zero when the DIS2116 is switched on (range of zero setting device $\pm 2...20$ %). This takes into consideration the set standstill condition.

7.8 Error displays

The permissible display range depends on the nominal value of the scale and the set mode of operation (not legal for trade / OIML / NTEP).

MODE → LEGAL-FOR-TRADE	Lower display limit	Upper display limit
NO (not legal-for-trade)	-160 %	+160 %
OIML	-2 %	Nominal value + 9 d
NTEP	-2 %	Nominal value + 5 %

The percentages relate to the nominal weighing range ("NOMINAL VALUE" parameter)

The following error message appears in the display when the measured value is

outside the maximum display range: -----

Other errors are displayed as a four-digit code with explanation

(e.g. ERROR!)

CODE 5700

No standstill

No measured value acquired

They should not occur in normal operation (see also Chapter 20.2, page 108).

7.9 Standstill recognition

The zeroing, taring and printing functions are only executed if the value in the display is stable. This is known as standstill and is indicated by showing the unit of measurement. The condition for standstill is that the value changes by no more than a specific fluctuation limit per time unit. With fluctuating (wind) loads or a very high scale resolution, it is quite possible that standstill will never be achieved. In this case, a more strongly damping filter or a lower resolution must be selected in the parameter setting.


The various options for standstill indication can be selected in the "SCALE PARAMETERS-PARAMETER → STANDSTILL MON." menu, see also Chapter 8.5.11. (page 55).

It is also possible to switch off the standstill conditions (but not for legal-for-trade applications). The unit is always displayed when standstill monitoring is switched off.

8 Parameter menu

8.1 Calling the parameter menu

There are several ways to activate the parameter menu:

- Press the  key **or**
- Press the hidden pushbutton **or**
- Press the F5 key on an external keyboard

The difference is the access to the legal / scale adjustment parameters:

Pressing the hidden pushbutton gives access to the legal parameters of the first menu level ("PARAMETER MENU – FUNCTION KEYS, MODE, SCALE CONFIGURATION, SCALE PARAMETERS, OFF-CENTER LOAD COMPENSATION, FACTORY SETTINGS"), otherwise these parameters are only displayed.

8.2 Disabling/enabling menu functions

The parameter menu has so-called access levels (0...5). This feature is used to enable or disable user access to the parameters. Only those menu items that are enabled are displayed.

Access to change parameters is defined in the "PARAMETER MENU-MODE-ACCESS LEVEL" menu. Access level 0 disables most menus,access level 5 enables all parameter menus. The "PARAMETER-MODE-ACCESS LEVEL" menu is protected by the hidden pushbutton.

Parameter ACCESS LEVEL	Enabled access levels
0	0 only
1	0 and 1
2	0 to 2
3	0 to 3
4	0 to 4
5	All

8.3 The main menu

To make things clearer, the parameters are grouped into several sub-menus, which can be called from the main menu. It is also possible to print out the parameters here (only when the printer interface is active). Certain parameters are not accessible in every mode of device operation, or are read-only. To make adjustments for legal-for-trade devices, it is necessary to actuate a hidden pushbutton, which is only accessible once the calibration or sealing label has been removed.

The parameter menu contains the following items:




Access level	Main menu level	Explanation	Legal-for-trade-parameter ¹⁾
0	INFORMATION	Information (Chap. 8.5.1)	–
1	PRINT	Print (Chap. 8.5.2)	–
2	LIMIT VALUE	Limit values (Chap. 8.5.3)	–
4	FILTER	Filter (Chap. 8.5.4)	–
4	COMMUNICATION	Interface settings (Chap. 8.5.5.)	–
3	PRINT PROTOCOL	Print protocol settings (Chap. 8.5.6.)	–
4	CLOCK	Real time settings (Chap. 8.5.7.)	–
4	FUNCTION KEYS	Function key assignments (Chap. 8.5.8.)	Yes
4	DISPLAY	Setting the Info line 1 and 2 contents, contrast (Chap. 8.5.9.)	–
0	FUNCTION TEST	Test functions DIS2116 (Chap. 8.5.10.)	–
0	MODE	Basic scale functions (Chap. 8.5.11.)	Yes
4	SCALE CONFIGURATION	Segments, load cells (Chap. 8.5.12.)	Yes
4	SCALE PARAMETERS	Basic scale functions (Chap. 8.5.13.)	Yes
5	OFF-CENTER LOAD COMPENSATION	Off-center load error compensation (Chap. 8.5.14.)	Yes
5	FACTORY SETTINGS	Reset to factory settings (Chap. 8.5.15.)	Yes


¹⁾ Access only via hidden pushbutton

8.4 Navigation in the parameter menu

The parameter menu has three levels. The first two levels are used for structuring the menu. Parameters are displayed and entered in the third level. All four keys (F1 – F4) are used for navigation in the parameter menu.

8.4.1 Navigation via device keys


Key	Explanation
	Open parameter menu
	Return to higher menu level or exit parameter menu
	Go to sub-menu / change parameter (Enter)
	F1 – F4 depending on displayed function

The parameter menu is opened by pressing the  key.


Level 1

The selected parameter block is indicated by a black bar.


The required parameter block is selected with the keys F2 or F3.

Use  (Enter) to access the selected sub-menu. The sub-menu is then displayed in Info line 1.

Level 2


Use keys F2, F3 to select the required sub-menu and open it with the  key (Enter).

Info line 1 displays the path Menu 1 – Menu 2
(e.g. COMMUNICATION – LOAD CELLS (COM1)).


Navigate to the required parameter with the keys F2, F3 and confirm your entry with  (ENTER).

Level 3

The parameter is displayed and the current setting indicated with a black bar and a * behind the set value.





Use the arrow keys F2, F3 to move the black bar to the new setting and confirm with  (ENTER).

The setting is applied and the sub-menu exited.

To cancel an entry without changing the parameter, leave the menu via the  key.

8.4.2 Navigation via external keyboard

The external keyboard is connected to the PS2 connector (Fig. 5–2)


Significance of the keys	
External keyboard (PS2)	DIS2116 front panel
F1 to F4	F1 to F4
 (Enter)	
ESC	
F5	

The arrow keys can also be used for navigation.

Key F5 Open parameter menu

↑↓ Select parameter (analogous to keys F2, F3)

→ Scroll to next level e.g. from level 1 to 2








← Scroll back to next level e.g. from level 2 to 1 (analogous to )

8.5 Full menu structure

The description follows the main menu sequence (for the first level, see Chapter 8.3 (page 37)).

8.5.1 “INFORMATION” parameter menu



Access:  Key, **INFORMATION**  (Enter)

Sub-menu explanation			
INFORMATION		Access level 0	
	SCALE		The scale type plate is displayed
	TARE VALUE		The tare value with unit is displayed
	WEIGHING RESULT		The last weighing result recorded with Weighing 2 is displayed. The full display contains the following parameters: Vehicle number, goods, process, Weighing1, Weighing2, tare, result, date, time and print No.
	BUSSCAN		All digital load cells connected to the DIS2116 are displayed in ascending address order. The address, type, serial number, legal-for-trade and overload counters are displayed in one line for each load cell. The header displays, for the selected load cell: the manufacturer, TYPE, serial number and software version.
	ERROR LIST		The errors occurred are displayed with the error number, date, time, load cell address and frequency.
	SOFTWARE INFO		Software version of display incl. date and time of creation.
	GRAPHIC		OSCILLOSCOPE: Graphic display of measured values
			CENTER OF GRAVITY: Graphic center of gravity display, from 3 load cells upwards

8.5.2 “PRINT” parameter menu








The Print function is only accessible if COM3 is activated for printing.

Access:  Key,   (Enter),

Sub-menu explanation		
PRINT		Access level 1
	MEASURED VALUE	 “Measured value” Sub-menu (8.5.2.1)
	PARAMETER	 “Print parameters” Sub-menu (8.5.2.2)

8.5.2.1 “PRINT – MEASURED VALUE” parameter menu




Access:  Key,    (Enter)

Sub-menu explanation		
PRINT		Access level 1
	MEASURED VALUE	“Measured value” Sub-menu (8.5.2.1)
	None	 No print protocol selected (8.5.2.2)
	Prt01 – MV(Act)	 Print protocol selection. Printing is initiated via key F1, when the symbol  is displayed.
	Prt02 – MV1	
	Prt03 – MV2	
	Prt04 – Total	
	Prt05 – Result	

The print function is described in Chapter 15 (page 96).

8.5.2.2 “PRINT – PARAMETERS” parameter menu



Access:  Key,     (Enter)

Sub-menu explanation			
PRINT – PARAMETERS		Access level 1	
	SCALE PARAMETERS		The adjustment parameters of the load cells are printed.
	DIS2116 PARAMETER		The settings of the DIS2116 display are printed.
	BUSSCAN RESULT		The results of the BUS SCAN are printed.

The print function is described in Chapter 15 (page 96).




8.5.3 “LIMIT VALUES” parameter menu

Access:  Key,   (Enter)

Sub-menu explanation			
LIMIT VALUES		Access level 2	
	LIMIT VALUE 1		Limit value 1 setting
	LIMIT VALUE 2		Limit value 2 setting


8.5.3.1 “LIMIT VALUES – LIMIT VALUE 1” parameter menu

Access:  Key,     (Enter)


Sub-menu explanation			
LIMIT VALUES – LIMIT VALUE 1		Access level 2	
	INPUT SIGNAL		Selection of input signal for limit value 1
		OFF	Limit value 1 is switched off, no monitoring
		NET*	The net measured value is monitored
		GROSS	The gross measured value is monitored
	ACTIVATION LEVEL		The activation level is input as a weight value. If the input signal exceeds the activation level, the symbol for limit value 1 is displayed
	DEACTIVATION LEVEL		The deactivation level is input as a weight value. If the input signal undershoots the deactivation level, the limit value 1 symbol disappears

* Factory settings

Input activation level > deactivation level

If the selected measured value (gross or net) exceeds the set limit value 1 (2), this is displayed in the status line ( 1,2).

Input deactivation level > activation level

The limit value display ( 1,2) is displayed in the status line until the measured value (gross, net) exceeds the set limit value 1 (2).



8.5.3.2 “LIMIT VALUES – LIMIT VALUE 2” parameter menu

Access:  Key,     (Enter)

The sequence for setting limit value 2 is identical to that for limit value 1, Chap. 8.5.3.1).

8.5.4 “FILTER” parameter menu




Access:  Key,  (Enter)

Sub-menu explanation			
FILTER		Access level 4	
	FILTER MODE		Selection of filter characteristics (8.5.4.1)
		FILTER MODE	
		0-IIR2*	Standard filter IIR – 2nd order low-pass filter
		1-FIR32	3-stage fast-settling digital filters (FIR low-pass filters)
		2-IIR8	IIR 8th order low-pass filters
		3-IIR4FT	Fast-settling digital filters (IIR 4th order low-pass filters)
		4-FIR64	Fast-settling digital filters (FIR low-pass filters, settling time < 100 ms)
	LIMIT FREQUENCY		The limit frequency can be set in 11 steps. The appropriate limit frequencies (in Hz) can be found in the descriptions of the connected load cells (C16i, measurement chains; FMD , ASF commands).

The filter characteristics are described in Chapter 9, page 65.


8.5.5. “COMMUNICATION” parameter menu

Access:  Key, **COMMUNICATION**  (Enter)

Sub-menu explanation				
COMMUNICATION			Access level 4	
	LOAD CELLS (COM1)		BAUD RATE	9.6K, 19.2K, 38.4K*, 57.6K, 115.2k
			2-WIRE COMM.	OFF: Full duplex Separate transmission-reception lines 4-wire ON*: Half duplex Common transmission and - reception line 2-wire
	PC/PLC (COM2)		FUNCTION	OFF * Interface is inactive ON Interface is active
			BAUD RATE	Baud rate setting for processor communication: 1.2K, 2.4K, 4.8K, 9.6K *, 19.2K, 38.4K, 57.6K, 115.2K
			PARITY	NONE*, EVEN, ODD
	PRINTER (COM3)		FUNCTION	OFF Interface is inactive ON * Serial (RS-232) interface is active ON USB interface- (USB) is active
			BAUDRATE (RS-232)	1.2K...115.2K
			PARITY (RS-232)	NONE*, EVEN, ODD

* Factory settings

"COMMUNICATION" parameter menu (continued)

	EXT.DISPLAY (COM4)		PROTOCOL (RS-232)	DTR * Hardware handshake DC1 Software handshake
			FUNCTION	OFF * Interface inactive String 1 String 2 see String 3 Chapter 15 String 4 String 5
			STANDARD- DISPLAY ¹⁾	– No microSYST MIGRA (numeric display) microSYST MIGAN (graphic display)
			PROTOCOL	OFF * No handshake DTR Hardware handshake DC1 Software handshake
			BAUD RATE	1.2K...115.2K
			PARITY	NONE*,EVEN, ODD
			START STRING LENGTH	0* = No start string 1...15 = Number of characters for start string
			Character 1... Character 15	For start string length > 0, input character for end string

* Factory settings

"COMMUNICATION" parameter menu (continued)











			END STRING LENGTH	0* = No end string 1...5 = Number of characters for end string
			Character 1... Character 5	For end string length > 0, input character for end string
			CRC	OFF No checksum ON * Checksum
			DECIMAL POINT	POINT* COMMA OFF No decimal point
			PAUSE [10ms]	Time until display string is repeated
			MEASURED VALUE LENGTH	Number of measured value digits that can be displayed Standard (9 digits) 2...9 digits for the measured value

* Factory settings

- 1) When connecting and selecting a standard display, the COM4 interface is automatically configured, no further settings are required under EXT. DISPLAY (COM4). The technical data for the standard display can be found in the manufacturer's documents.

8.5.6. “PRINT PROTOCOL” parameter menu

Access:  Key, **PRINT PROTOCOL**  (Enter)

Sub-menu explanation			
PRINT PROTOCOL		Access level 3	
	PRINTOUT NUMBER		Consecutive number of printout
	USER-DEF. LINE 1		A maximum of 32 text characters can be entered for printout in line 1.
	USER-DEF. LINE 2		A maximum of 32 text characters can be entered for printout in line 2.
	USER-DEF. LINE 3		A maximum of 32 text characters can be entered for printout in line 3.
	BLANK LINES ABOVE		0 to 99 blank lines above the printout of USER DEFINED LINE 1
	BLANK LINES BELOW		0 to 99 blank lines below the printout of USER DEFINED LINE 3
	SPACES		0 to 99 spaces
	PAGE FEED		OFF* After printing, a page feed is not carried out. ON Page feed after printing
	ESCAPE1 (1st CHARACTER) to ESCAPE1 (5th CHARACTER)		Input of an ESCAPE sequence that consists of maximum 5 characters. The characters are entered as ASCII characters with their decimal value.
	ESCAPE2 (1st CHARACTER) to ESCAPE2 (5th CHARACTER)		Input of an ESCAPE sequence that consists of maximum 5 characters. The characters are entered as ASCII characters with their decimal value.

* Factory settings



2 ESCAPE sequences can be entered with ESCAPE1 and ESCAPE2. Each ESCAPE sequence consists of maximum 5 characters.

8.5.7. “CLOCK” parameter menu

The date consists of xx.yy.zz (DAY/MONTH/YEAR). When entering the day or month, inputs of 01 to 31 and 01 to 12 are permissible; if a number combination outside 01–31 and 01–12 is entered, the previous value is displayed again and the dialog cannot be exited. DAY, MONTH and YEAR must always be entered with 2 digits.

The 24 hour or 12 hour mode can be selected for the time display.

Access:  Key,   (Enter)







Sub-menu explanation				
CLOCK			Access level 4	
	DATE		DAY	The DAY is input with 2 digits from 01 to 31
			MONTH	The MONTH is input with 2 digits from 01 to 12
			YEAR	The YEAR is input with 2 digits from 00 to 99
	TIME		MODE	24h 24 hour mode 12h 12 hour mode
			MINUTES	Input 00...59 minutes
			HOURS	In 24h mode: 00...23 In 12h mode: 00...12 Toggle with F1 AM/PM

8.5.8. “FUNCTION KEYS” parameter menu

The meaning of the function keys is displayed in the function line. The function line is changed with F4.

The applicable functions are enabled/disabled in the “Function keys” dialog.

Access:  Key, **FUNCTION KEYS**  (Enter)

Sub-menu explanation				
FUNCTION KEYS			Access level 4	
	ZEROING		INACTIVE	The zeroing function is not available in measuring mode
			ACTIVE*	In measuring mode, the function key F3 (level 3) is assigned with the zeroing function (>0<)
	TARING		INACTIVE	The taring function is not available in measuring mode
			ACTIVE*	In measuring mode, the function key F3 (level 2) is assigned with the taring function (>T<)
	GROSS/NET		INACTIVE	The toggle GROSS/NET function is not available in measuring mode
			ACTIVE*	In measuring mode, the function key F2 (level 2) is assigned with the Gross/Net function
	10-FOLD RESOLUTION		INACTIVE*	The 10–fold resolution function is not available in measuring mode
			ACTIVE	In measuring mode, the function key F2 -(level 3) is assigned with the 10–fold resolution (x10) function
	PRINT		INACTIVE*	The print function is not available in measuring mode
			ACTIVE	In measuring mode, the function key F2 (level 3) is assigned with the print function ()


* Factory settings


8.5.9. “DISPLAY” parameter menu

The contents of information lines 1 and 2 are set in the display dialog as is the display contrast.




Information lines 1 and 2 are divided into 2 segments each, so that you can freely assign the listed display content options for the information lines. A maximum of four information items can be displayed.

The following information is available:

	Nothing is displayed in the selected segment
Scale ID:	Manufacturer, TYPE, serial number and software version. To display this information in full, both segments (left and right) of the information line are required. Information line left: Manufacturer and type Information line right: Serial number and software version
Weighing 1	Measured value of first measurement (check-in scale)
Weighing 2	Measured value of second measurement (check-out scale)
Total	Weighing result weighing2 – weighing1
TCR	LFT counter displays number of verification procedures
TRUCK	Vehicle number plate
GOODS	Description of goods
ERROR	In the case of an error, the error number is displayed
TARE	The current tared weight is displayed
TARE PT	A manually entered tare value (Manual tare/Pre-tare)
Date/Time	Current date with time

Select the required entry with the keys F2, F3 and accept with 

Access:  Key, **DISPLAY**  (Enter)




Sub-menu explanation				
DISPLAY			Access level 4	
	DISPLAY LINE 1		LEFT	Display in the left half of the information line 1.
			RIGHT	Display in the right half of the information line 1.
	DISPLAY LINE 2		LEFT	Display in the left half of the information line 2.
			RIGHT	Display in the right half of the information line 2.
	CONTRAST		-10 ... 0* ... +10	The contrast can be adjusted in 21 steps from -10 to +10.

* Factory settings






8.5.10. “FUNCTION TEST” parameter menu

In the “FUNCTION TEST” menu, the function of the interfaces, display, keys and the SD card can be checked.



Access:  Key, **FUNCTION TEST**  (Enter)

Sub-menu explanation				
FUNCTION TEST			Access level 4	
	BUSSCAN		A search is made for all digital load cells connected to COM1. All located digital load cells are displayed with the address, serial number, TCR status, overload counter status. A load cell can be selected with the keys F2, F3. The line above the table displays the manufacturer, type, serial number and software version of the selected load cell.	
	LOAD CELL		LOAD CELL - ADDRESS	Enter the address of the load cell to be checked
			MEASURED VALUE	The measured value of the selected load cell is displayed in internal digits. If a non-existent address is selected, 9 star symbols are displayed instead of the measured value.
			LOAD CELL TEST	Checking the selected load cell
	SEGMENT		SEGMENT NUMBER	Enter the number 1 to 3 of the segment to be checked
			MEASURED VALUE	The measured values of all load cells in the selected segment, and the total measured value, are displayed in weight units. Only segments that are present can be selected.

“FUNCTION TEST” parameter menu (continued)

	COM1		COM1 test	At COM1 (load cell interface) the capital letter U (0x55) is permanently output. If the transmission outputs TB and TA are connected to the inputs RB and RA, the transmitted character is received again and displayed. In COM1 test, the number of transmitted and received characters are displayed. No load cells must be connected at the interface when checking COM1.
	COM2		COM2 test	The capital letter U (0x55) is permanently output at the selected interfaces COM2 (PC/PLC), COM3 (printer) and COM4 (second display). If the transmission output Tx is connected to the reception input Rx, the sent character is received again and displayed. The number of transmitted and/or received characters is displayed.
	COM3		COM3 test	
	COM4		COM4 test	
	SD CARD		SD test	The internal memory card is checked and the free memory displayed in Byte.

“FUNCTION TEST” parameter menu (continued)

	DISPLAY			Various patterns are displayed in the display field for the display test.
	KEYS		Key test	The corresponding key code is displayed if the key is recognized when a key is pressed. The exception is the CE key, as pressing the CE key ends the KEY test.

8.5.11. “MODE” parameter menu

The following functions are set in the “MODE” menu:

LANGUAGE (see following table for explanation)

ACCESS LEVEL

The “ACCESS LEVEL” menu is used to specify which menus are still accessible to the user (see right column in following table). If the DIS2116 is verified, the access levels can only be changed via the hidden pushbutton. The access levels can be set in 5 levels.



LEGAL-FOR-TRADE CAPABILITY (see following table for explanation)

Weights and measures regulation and class settings. If the DIS2116 is set to “OIML, NTEP”, this setting can only be changed via the hidden pushbutton.

ENCRYPTION (see following table for explanation)




OPERATING MODE (see following table for explanation)

Access:  Key,  **MODE**  (Enter)

Sub-menu explanation				
MODE			Access level 0	
	LANGUAGE		ENGLISH	Menu texts and dialog in English
			DEUTSCH*	Menu texts and dialog in German
			РУССКИЙ	Menu texts and dialog in Russian
			FRANCAIS	Menu texts and dialog in French
			ITALIANO	Menu texts and dialog in Italian
			ESPANOL	Menu texts and dialog in Spanish
			CATALA	Menu texts and dialog in Catalan
			PORTUGUES	Menu texts and dialog in Portuguese
	ACCESS LEVEL		0	Enabled menus: INFORMATION FUNCTION TEST MODE
			1	Enabled menus: INFORMATION PRINT FUNCTION TEST MODE

* Factory settings






"MODE" parameter menu (continued)

			2	Enabled menus: INFORMATION PRINT LIMIT VALUE FUNCTION TEST MODE
			3	Enabled menus: INFORMATION PRINT LIMIT VALUE PRINTER FUNCTION TEST MODE
			4	INFORMATION PRINT LIMIT VALUE FILTER COMMUNICATION PRINTER CLOCK FUNCTION KEYS DISPLAY FUNCTION TEST MODE
			5*	All menus are accessible
	LEGAL-FOR-TRADE CAPABILITY		NO*	Not legal for trade
			OIML III	
			OIML IIII	Ordinary accuracy weighing machines up to 1000 d
			NTEP III	
			NTEP IIII	US truck scales up to 10000 d
	ENCRYPTION		OFF*	The measured values are transmitted unencrypted.
			ON	The measured values are transmitted encrypted. In verified operation, this setting can only be changed via the hidden pushbutton.
	OPERATING MODE		Standard*	
			Vehicle	See Chap. 13, Vehicle scale.

* Factory settings

8.5.12. “SCALE CONFIGURATION” parameter menu

Access:  Key, **SCALE CONFIGURATION**  (Enter)

Sub-menu explanation				
SCALE CONFIGURATION			Access level 4	
	SEGMENT NUMBER		1 segment*	Segment selection Each segment can contain up to eight load cells.
			2 segments	
			3 segments	
	SEGMENT 1		NUMBER OF LOAD CELLS	Number of load cells used in segment 1. Selection: 1*, 3, 4, 6, 8
			SERIAL NUMBER LC11 to LC18	The load cell serial number must be entered for the selected load cell. The load cell with this serial number is assigned the applicable address. <i>Example: Serial number LC11: 102345. The load cell with the serial number 102345 is assigned the address 11</i>
	SEGMENT 2		NUMBER OF LOAD CELLS	Number of load cells used in segment 2. Selection: 1*, 3, 4, 6, 8
			SERIAL NUMBER LC21 to LC28	Inputs as in Segment 1 <i>Example: Serial number LC21: 102345. The load cell with the serial number 102345 is assigned the address 21</i>
	SEGMENT 3		NUMBER OF LOAD CELLS	Number of load cells used in segment 3. Selection: 1*, 3, 4, 6, 8
			SERIAL NUMBER LC31 to LC38	Inputs as in Segment 1 <i>Example: Serial number LC31: 102345. The load cell with the serial number 102345 is assigned the address 31</i>
	CONFIGURATION			

* Factory settings

8.5.13. “SCALE PARAMETERS” parameter menu

The following functions are set in the “SCALE PARAMETERS → PARAMETER” menu:

<u>MANUFACTURER</u>	(see following table for explanation)
<u>IDENTIFICATION</u>	(see following table for explanation)
<u>LOAD CELL MEASURING RATE</u>	(see following table for explanation)
<u>UNIT</u>	(see following table for explanation)

The unit is displayed with the measured value and is also used for standstill check. Visible unit of measurement means standstill.

DECIMAL POINT

x = no decimal place
 x.x = one decimal place
 x.xx = two decimal places, etc.

NOMINAL VALUE

The nominal value must be entered numerically correct with all places.
E.g. 50kg with 5000 divisions resolution input: 50.00 kg

MULTIRANGE 1

The measuring range is displayed with measured value status.
Example: 100.00 kg scale MULTIRANGE 1 50.00 kg
0...50 kg measuring range 1 resolution 10g >|1|<
50...100 kg measuring range 2 resolution 20g >|2|<

MULTIRANGE 2

The measuring range is displayed with measured value status.
Example. 100.00 kg scale MULTIRANGE 1 50.00 kg
MULTIRANGE 2 80.00 kg
0 ...50 kg measuring range 1 resolution 10g >|1|<
50...80 kg measuring range 2 resolution 20g >|2|<
80...100 kg measuring range 3 resolution 50g >|3|<

RESOLUTION

Increment input. The value determines the resolution of the last place(s)

E.g.: Nominal value = 50.00 kg = 5000d
 Resolution = 1d Total resolution = 5000d
 Resolution = 2d Total resolution = 2500d
 Resolution = 5d Total resolution = 1000d

In multi-range scales, the increment is automatically increased when switching to the next range. The resolution for the first range must be input.

E.g. 3-range scale, resolution set = 1d
 Weight < MR 1 Resolution 1d
 MR 1 < Weight < MR 2 Resolution 2d
 Weight > MR 2 Resolution 5d
 MR= Multi-range

The settings made are also entered into the electronic type plate (“INFORMATION → SCALE” Menu)

ZERO TRACKING

The automatic zero tracking occurs for a gross or net measured value $<0.5 d$ in the range $+ 2 \%$ of the nominal value of the scale. The maximum tracking speed is $0.5 d/s$ when the scale is at standstill. Standstill recognition can be set in the Standstill monitoring parameter. The unit d (digit) is equal to one verified scale division e .

ZERO ON START-UP

Zero on start-up means that, when the scale is switched on, a weight up to max. $\pm 20 \%$ of the nominal value is set to zero once. In legal-for-trade applications, a max. of $\pm 10 \%$ of the nominal value can be set to zero. Zero setting is only implemented at a standstill and when the weight is within the specified range. Possible settings are OFF, $\pm 2 \%$, $\pm 5 \%$, $\pm 10 \%$ and $\pm 20 \%$ of the nominal value.

STANDSTILL MONITORING

Standstill check. Standstill means that the weight does not change by more than the set value in one second. Standstill is indicated by the unit of measurement. If the standstill condition is not met, the unit of measurement is not displayed. The setting $1d/s$ applies for a legal-for-trade scale.

The following settings are possible:

- | | |
|---------|--|
| OFF | Standstill monitoring is disabled, the display is always in the standstill mode, the unit of measurement is permanently displayed. |
| 0.25d/s | Standstill is when the weight value does not change by more than $0.25 d$ in one second. |
| 0.5d/s | Standstill is when the weight value does not change by more than $0.5 d$ in one second. |
| 1d/s | Standstill is when the weight value does not change by more than $1 d$ in one second. |
| 2d/s | Standstill is when the weight value does not change by more than $2 d$ in one second. |
| 3d/s | Standstill is when the weight value does not change by more than $3 d$ in one second. |

Example:

If a resolution of $1 g$ and standstill monitoring of $1 d/s$ is set, the standstill condition is met when the weight value does not change by more than $1 g/s$.


G-FACTOR CALIBRATION /APPLICATION

The g-factor setting is only required when the scale is calibrated at the production site and operated at another place with this setting. If the scale is calibrated at the installation site, both g-factors must be identical.

MANUAL TARE MODE/VALUE

Input of a known TARE value. The input TARE value is displayed as a manual tare value with the symbol PT in the display. The display [Tare PT] must be activated for this in "DISPLAY→DISPLAY LINE 1(2)".



Access:  Key , **SCALE PARAMETERS**  (Enter)

Sub-menu explanation				
SCALE PARAMETERS		Access level 4		
	PARAMETER		MANUFACTURER	Enter a manufacturer ID with max. 3 letters. This designation can be found in the scale ID.
			IDENTIFICATION	Enter a type designation or name with max. 15 characters. This designation can be found in the scale ID.
			LOAD CELL MEASURING RATE	Standard* High speed ¹⁾
			UNIT	Enter a unit of measurement with max. 4 letters.
			DECIMAL POINT	Enter the number of decimal places.
			NOMINAL VALUE	Enter the scale maximum capacity. The decimal point and unit must be set before.
			MULTIRANGE 1	Changeover point from measuring range 1 to measuring range 2.
			MULTIRANGE 2	Changeover point from measuring range 2 to measuring range 3.
			RESOLUTION	1d*; 2d; 5d; 10d; 20d; 50d; 100d;
			ZERO TRACKING	OFF* ON
			ZERO ON START-UP	OFF* 2 % 5 % 10 % 20 %





* Factory settings

¹⁾ The current measuring ranges in measurements/sec can be found in the documentation of the load cells used (measurement chains).

"SCALE PARAMETERS" parameter menu (continued)

			STANDSTILL MONITORING	OFF* 0.25 d 0.5 d 1 d 2 d 3 d
			G-FACTOR CALIBRATION	Enter g (gravitational acceleration) at calibration location e.g. 98104
			G-FACTOR APPLICATION	Enter g (gravitational acceleration) at operating location e.g. 98109
			MANUAL TARE MODE	OFF* ON
	INPUT CHARACTERISTIC CURVE		CALIBRATION WEIGHT	The calibration weight must be set to the maximum capacity.
			ZERO LOAD	Enter the value for the unloaded scale in internal digits.
			MAXIMUM CAPACITY	Enter the value for the scale loaded with the maximum capacity.
	MEASUREMENT CHARACTERISTIC CURVE		CALIBRATION WEIGHT	The calibration weight is entered in weight units. It should be min. 20% and max. 120% of the scale maximum capacity. An adjustment of up to 5% of the scale maximum capacity is also possible for non-legal-for-trade scales. It must be noted that the smaller the balancing weight is, the greater the error in the final value.

“SCALE PARAMETERS” parameter menu (continued)

			ZERO LOAD	The measured value for the unloaded load cell is displayed in internal digits. When the display is settled, the value is accepted with  and the dialog exited.
			MAXIMUM CAPACITY	The measured value for the load cell loaded with the calibration weight is displayed in internal digits. When the display is settled, the value is accepted with  and the dialog exited.
	LINEARIZATION		WEIGHT 1	see Chap. 11
			MEASURED VALUE 1	
			INPUT MEASURED VALUE 1	
			WEIGHT 2	
			MEASURED VALUE 2	
			INPUT MEASURED VALUE 2	
	LOAD CELL REPLACEMENT		LOAD CELL ADDRESS	Enter the address of the load cell to be replaced.
			NEW SERIAL NUMBER	Serial number of the new load cell.
			UPLOAD PARAMETER	Initialization of the new load cell with the parameters of the replaced load cell.

The parameters of the defective load cell are transferred to the new load cell. After a defective load cell is replaced, a new adjustment is not necessary, but the new load cell must be installed in the same manner as the replaced one.



8.5.14. “OFF-CENTER LOAD COMPENSATION” parameter menu

The scale is loaded at different points with a weight of 20 % (5 %) to 120 % of the nominal value. Once this procedure is complete, the off-center load error is compensated and the scale adjusted.

There are three methods for compensation of off-center load errors:

Example: Method for off-center load error compensation for a scale with 4 load cells (addresses 11...13)

Access:  Key, **OFF-CENTER LOAD COMPENSATION**  (Enter)







Sub-menu explanation				
OFF-CENTER LOAD COMPENSATION			Access level 5	
	MEASURE		MODE	SIMPLE AVERAGE PRECISE
			CALIBRATION WEIGHT	Weight used for off-center load compensation.
			SEGMENT 1	Segment in which the off-center load compensation is made. The steps are explained in the Chapter “Off-center load compensation”.
	INPUT SEGMENT 1		CORRECTION VALUE	Numerical input

The procedure for digital OFF-CENTER LOAD COMPENSATION is described in detail from Chapter 10.6 onwards.

The entry of a correction value is described in Chapter 10.6.4, page 79.

8.5.15. “FACTORY SETTINGS” parameter menu

Access:  Key, **FACTORY SETTINGS**  (Enter)

Sub-menu explanation				
FACTORY SETTINGS		Access level 5		
	DIS2116		Factory settings? YES NO	You are asked again Factory settings? YES (F2) The factory settings are restored, all data reset to factory settings. NO (F3) The Restore factory settings function is cancelled.
	LOAD CELLS		Reset load cells? YES NO	You are asked again Reset load cells? YES (F2) The factory settings are restored in all load cells connected to the DIS2116. NO (F3) The Restore factory settings function is cancelled.
	DATABASE		Delete yard list 	You are asked again Delete yard list? YES (F2) All vehicles will be deleted from the yard list (list of accepted vehicles). NO (F3) The dialog is exited without deleting the yard list.
			Database repair 	You are asked again Start repair? YES (F2) The database entries list will be restored. NO (F3) The dialog is exited. The function will not be carried out.

9 Filter selection

The DIS2116 has five different filters. These can be selected via the "FILTER–FILTER MODE" parameter menu :

- Standard filter (IIR low-pass filter)
- Fast-settling filter (FIR low-pass filter)
- IIR 8th order low-pass filter
- Fast-settling digital filter (IIR 4th order low-pass filter)
- Fast-settling digital filter (FIR low-pass filter)

The filter limit frequency can be set in 10 steps (0...9). The settings are made in the "FILTER–LIMIT FREQUENCY" parameter menu.

Setting 0 means that the filter is disabled.

The particular application determines which filter mode is selected.

A low bandwidth has a longer settling time and should be selected for greater accuracy.

Scale resolution ("NOMINAL VALUE" parameter) and standstill recognition are interlinked. If standstill is not achieved, the filter bandwidth must be reduced.



NOTE

The filters are part of the load cells, their properties are described in the documentation for the load cells (C16i, measurement chains). (Commands **FMD**, **ASF**, **HSM**).

10 Scale adjustment

The scale is adjusted by setting the user characteristic curve on the DIS2116, that is to say, the scale electronics adapt to the current output signals that the digital load cell(s) supplies when the scale(s) is not loaded or at nominal weight. Calibration weights are usually required for this, although the alternative is to input the measured values, if these are known.

The adjustment range depends on the maximum capacity of the load cells used. The factory setting is a resolution of 10,000d for the maximum capacity of the scale, adjusted (factory settings, see Chapter 8.5.12. (page 57)).

Two methods are available to adjust a scale.

1. Scale adjustment by measuring the characteristic curve
This method is described in Chapter 10.2 to 10.5.
2. Scale adjustment with digital off-center load compensation
From a scale configuration with minimum 4 load cells, the scale adjustment can also be implemented with digital off-center load compensation.
This method is described in Chapter 10.6.

10.1 Configuration of the load cells

During initial commissioning, all load cells have the same address (31), measured value display is not possible, the display will show an initialization error [INIT ERROR].

Each load cell must be assigned its own address. This is possible with the aid of the load cell serial number.

Proceed as follows:

- The parameter menu must be called via the hidden pushbutton
- "SCALE CONFIGURATION" parameter menu

The addresses for the load cells must be assigned for each segment increasing clockwise (e.g. in segment 1, start in one corner with the address 11).



NOTE

If the load cells have already been assigned individual addresses (e.g. with the AED panel), measured values are displayed after switching on and you can start directly with scale adjustment.

10.2 Prerequisites for scale adjustment

Before the scale can be adjusted, the nominal range of the scale and other parameters must be set.

The prerequisites here are:

- The parameter menu must be called via the hidden pushbutton
- "MODE-ACCESS LEVEL" parameter menu= 5 (access to all menus)
- "MODE-LFT CAPABILITY" parameter menu = OFF (LFT application disabled)
- Set "SCALE PARAMETERS-PARAMETER → UNIT-DECIMAL POINT-NOMINAL VALUE-RESOLUTION" parameter menu
- Set "SCALE PARAMETERS-PARAMETER-G-FACTOR CALIBRAT" parameter menu to the gravitational acceleration value of the adjustment location.
- "SCALE PARAMETERS-PARAMETER-G-FACTOR APPLICATION" parameter menu = G-FACTOR CALIBRAT." (disable gravitational acceleration correction).
- Disable linearization in "SCALE PARAMETERS- LINEARIZATION" parameter menu: WEIGHT1 = WEIGHT2 = MEASURED VALUE1 = MEASURED VALUE2 = 0)

See Chapter 8.5.10. (page 52) and 8.5.11. (page 55).

10.3 Scale adjustment with maximum capacity (standard method, calibration weight = nominal value)

In most scale applications, the adjustment is made at two points, that is to say, when the scale is not loaded and when a calibration weight is placed on it. Calibration is carried out as follows:

1. Call up "SCALE PARAMETERS" parameter menu
2. Check that the calibration weight is the same as the maximum capacity (calibration weight = nominal value).
3. Go to the "MEASUREMENT CHARACTERISTIC CURVE" (measurement) sub-menu.
4. Zero value:
 - The scale is not loaded
 - Call up "ZERO LOAD" sub-menu
 - The current measured value is displayed with internal resolution (the displayed value is e.g. dependent on the number of load cells).
 - Wait for a steady measurement display
 - Press the "ENTER" key to store the value.
5. Calibration weight:
 - Place the calibration weight (= maximum scale capacity) onto the scale
 - Call up sub-menu "MAXIMUM CAPACITY"
 - The current measured value is displayed with internal resolution.
 - Wait for a steady measurement display
 - Press the "ENTER" key to store the value.

Use the "CE" key to cancel at any time. This will reset the parameter that has just been called (and this one only!) to its former value. The former value is only deleted after storing.

The two values are stored internally at high resolution (internal digits).

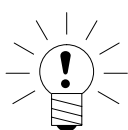
If the measurement display is too unsteady, reduce the filter bandwidth (Chapter 9, page 65)

The other parameters must then be set.

10.4 Scale adjustment with partial load (calibration weight = 20 (5)... 120 % nominal value)

If there is no calibration weight corresponding to the maximum scale capacity available, a partial calibration can be performed. The "CALIBRATION WEIGHT" parameter must be set to the value of the calibration weight used. This must be in the range of 5 %...120 % of the maximum scale capacity. In LFT applications, the adjustment should be carried out with a calibration weight of at least 20% of the scale maximum capacity. The calibration weight is scaled like the display value (e.g. 2 kg = 2.000, with 3 decimal places).

Until a calibration has been performed, the calibration weight is the same as the nominal value.



NOTE

Before calibration, the "SCALE PARAMETERS → PARAMETER → NOMINAL VALUE" parameter must be set to the maximum scale capacity!

Calibration is carried out as follows:

1. Call up "SCALE PARAMETERS" menu
2. Go to the "MEASUREMENT CHARACTERISTIC CURVE" (measurement) sub-menu.
3. Set the calibration weight [CALIBRATION WEIGHT].
4. Zero value:
 - The scale is not loaded
 - Call up "ZERO LOAD" sub-menu
 - The current measured value is displayed with internal resolution (the displayed value is e.g. dependent on the number of load cells).
 - Wait for a steady measurement display
 - Press the "ENTER" key to store the value.
5. Calibration weight:
 - Place the calibration weight (= CALIBRATION WEIGHT) onto the scale.
 - Call up "MAXIMUM CAPACITY" sub-menu
 - The current measured value is displayed with internal resolution.
 - Wait for a steady measurement display
 - Press the "ENTER" key to store the value.

Use the "CE" key to cancel at any time. This will reset the parameter that has just been called (and this one only!) to its former value. The former value is only deleted after storing.

The two values are stored internally at high resolution (internal digits).

The other parameters must then be set.

If the measurement display is too unsteady, reduce the filter bandwidth (Chapter 9, page 65)

The other parameters must then be set.

10.5 Adjustment without calibration weight (computational adjustment)

If there is no calibration weight available, an adjustment can be performed by entering the calculated values.

When scales have vast maximum capacities, it is often not possible to use calibration weights for adjustment. The digital load cells (e.g. C16i) connected to the DIS2116 are calibrated at the factory to output a measured value of 1,000,000 at maximum capacity.

The user characteristic curve can therefore be determined from the known nominal value of the load cells. The zero value is defined by automatic measurement, but the nominal value is defined by manual input.

All load cells connected to a scale must have the same maximum capacity.

Prerequisite:

- Off-center load compensation must be disabled ("OFF-CENTER LOAD → COMPENSATION → MEASURING → SEGMENT1(2,3)" parameter menu

See Chapter 8.5.14., page 63.

1. Measuring the zero value of the characteristic curve when the scale is not loaded:

- Call up "SCALE PARAMETERS" parameter menu
- Go to the "MEASUREMENT CHARACTERISTIC CURVE" (measurement) sub-menu.
- Zero value:
 - The scale is not loaded
 - Call up "ZERO LOAD" sub-menu
 - The current measured value is displayed with internal resolution. (The displayed value is e.g. dependent on the number of load cells).
 - Wait for a steady measurement display
- Make a note of the measured value (mw0) for later input

2. Calculating the nominal value of the scale

The digital load cells (e.g. C16i) connected to the DIS2116 are calibrated at the factory to output a measured value of 1,000,000 at maximum capacity. The nominal value of the scale characteristic curve is composed of the zero value and the weighing range. As the zero value has already been measured, it only remains to define the weighing range.

$$\text{Weighing range} = \text{Load cell sensitivity [Digits]} \cdot \frac{\text{Scale maximum capacity}}{\text{Load cell maximum capacity}}$$

The load cell sensitivity is 1,000,000 at load cell maximum capacity. The load cell maximum capacity is stated on the load cell type plate. The following applies:

Scale maximum capacity < Load cell maximum capacity

The weighing range result is therefore a value in internal resolution (digits).

3. Input of characteristic curve

If you add the value for the weighing range to the previously measured zero value, you obtain the nominal value of the scale (mw1). The characteristic curve can now be input:

- Call up "SCALE PARAMETERS" parameter menu
- Go to the "INPUT CHARACTERISTIC CURVE" sub-menu.
- "CALIBRATION WEIGHT" menu . Enter the weight used for adjustment.
- Call up menu "ZERO LOAD" and enter measured value for unloaded scale (mw0).
- Call up "MAXIMUM CAPACITY" menu.
- Enter nominal value (mw1).

Scales with several load cells supply the nominal output signal (1000000 or the nominal value entered under SCALE PARAMETERS–PARAMETER–NOMINAL VALUE), if the weight applied is the maximum capacity.



NOTE

Adjustment in digits (internal resolution) does not achieve the same accuracy as adjustment with calibration weights and must therefore only be used for applications where accuracy is less.

10.6 Adjustment with digital off-center load compensation

In this adjustment variant, both the characteristic curve is determined and the off-center load error is compensated. A scale configuration with at least 4 load cells is required for digital off-center load compensation. An adjustment with off-center load compensation is only successful when the load cells in the segments 1...3 are arranged with clockwise ascending addresses (see illustrations on adjustment modes).

The following settings were made:

10.1 Configuration of load cells

10.2 Prerequisites for scale adjustment:

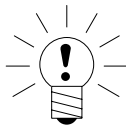
- Call up "OFF-CENTER LOAD COMPENSATION" parameter menu
- Call up menu "MEASUREMENT".
- In the "MODE" menu, select an adjustment variant Simple – Average – Precise
- In the "CALIBRATION WEIGHT" menu, enter the weight value used for adjustment.

The calibration weight is entered as the weight in weight units used for off-center load compensation. The balancing weight should be min. 20 % and max. 120 % of the scale maximum capacity. An adjustment of up to 5 % of the scale maximum capacity is also possible for non-legal-for-trade scales.

It must be noted that the smaller the balancing weight is, the greater the error in the final value.

- In SEGMENT 1, measure the weight values as specified and accept with F1. If the scale consists of more than one segment, the adjustment procedure for segments 2 and 3 is identical to that for segment 1.

There are three adjustment modes for off-center load compensation (simple – average – precise) These are described below.



NOTE

In the AVERAGE and PRECISE adjustment variants, the adjustment dialog indicates the point (corner) of the segment that has to be loaded. If the load is not applied to the indicated point, the measured value display of the loaded point (corner) flashes.

Remedy: Apply weight to indicated point.

10.6.1 Off-center load compensation mode “SIMPLE”

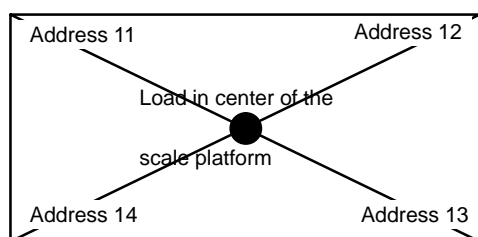


Fig.: Segment 1 with four load cells

The scale is loaded in the center. The measured values of all participating load cells are acquired for the unloaded scale and the scale loaded with the balancing weight. The off-center load error is compensated using the measured values of the participating load cells.

LC CALIBRATION (SIMPLE) : SEGMENT 1			
Measured value		Measured value	
ADR 11		ADR12	
CHARACTERISTIC CURVE WILL BE RESET !			
Measured value		Measured value	
ADR 14		ADR13	
<div><div>START</div><div>F1</div><div>F2</div><div>F3</div><div>F4</div></div>			

Display illustration: SIMPLE adjustment with 4 load cells ADR11 – ADR14 current value

The 4 load cells with the addresses 11...14 display the measured values of the respective load cells above the address.

Use the F1 key (START) to clear a previous adjustment, the dialog continues with the “UNLOADED SCALE” window. The scale should be unloaded now. The four load cells with the addresses 11...14 display the measured values of the respective load cells for the unloaded scale above the address.

Use the CE key to quit the dialog without clearing the previous adjustment.

LC CALIBRATION (SIMPLE) : SEGMENT 1			
Measured value		Measured value	
ADR 11		ADR12	
UNLOADED SCALE			
Measured value		Measured value	
ADR 14		ADR13	
ZERO			
F1	F2	F3	F4

Display illustration: SIMPLE adjustment with 4 load cells ADR11 – ADR14 zero value

The four load cells with the addresses 11 ... 14 display, the measured values of the corresponding load cells for the unloaded scale above the addresses.

The measured values are accepted with the F1 key (ZERO) when the display is still.

CALIBRATION WEIGHT (Balancing weight)

LC CALIBRATION (SIMPLE) : SEGMENT 1			
Measured value			Measured value
ADR 11			ADR12
	5.000		
Measured value			Measured value
ADR 14			ADR13
LOAD			
F1	F2	F3	F4

Display illustration: Simple adjustment with 4 load cells ADR11 – ADR14 load value

The selected balancing weight is displayed in the center. The scale has to be loaded with the calibration weight at the indicated place. The load cells display the measured value of the load cell above the address for the scale loaded with the balancing weight. The measured values are accepted with the F1 key when the display is still.

The set scale characteristic curve is calculated. The message "Completed successfully!" appears in the display. This message must be acknowledged with the F4 key.

The off-center load compensation in SIMPLE mode is then complete.

10.6.2 Off-center load compensation mode “AVERAGE”

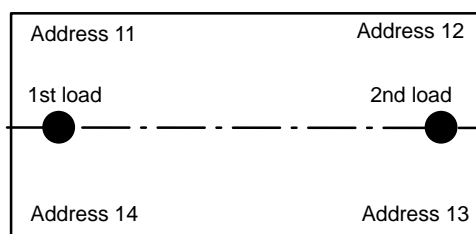


Fig.: Segment 1 with four load cells

Mode: AVERAGE

The scale is loaded each time with the calibration weight in the center between two neighboring load cells. Three measured values are recorded for a platform scale with 4 load cells.

Unloaded scale

1. Calibration weight between load cell 11 and 14
 2. Calibration weight between load cell 12 and 13
- The load location is displayed in the adjustment menu.

LC CALIBRATION (AVERAGE) : SEGMENT 1			
Measured value		Measured value	
ADR 11		ADR12	
CHARACTERISTIC CURVE WILL BE RESET !			
Measured value		Measured value	
ADR 14		ADR13	
<div><div>START</div><div>F1</div><div>F2</div><div>F3</div><div>F4</div></div>			

Display illustration: AVERAGE adjustment with 4 load cells ADR11 – ADR14 current value

The 4 load cells with the addresses 11...14 display the measured values of the respective load cells above the address.

Use the F1 key (START) to clear a previous adjustment, the dialog continues with the “UNLOADED SCALE” window. The scale should be unloaded now. The four load cells with the addresses 11...14 display the measured values of the respective load cells for the unloaded scale above the address.

Use the CE key to quit the dialog without clearing the previous adjustment.

LC CALIBRATION (AVERAGE) :		SEGMENT 1	
Measured value		Measured value	
ADR 11		ADR12	
UNLOADED SCALE			
Measured value		Measured value	
ADR 14		ADR13	
ZERO			
F1	F2	F3	F4

Illustration: AVERAGE adjustment with 4 load cells ADR11 – ADR14 zero value

The four load cells with the addresses 11 ... 14 display, the measured values of the corresponding load cells for the unloaded scale above the addresses.

The measured values are accepted with the F1 key (ZERO).

CALIBRATION WEIGHT (Balancing weight)

LC CALIBRATION (AVERAGE): SEGMENT 1			
Measured value		Measured value	
ADR 11		ADR12	
5.000			
Measured value		Measured value	
ADR 14		ADR 13	
LOAD 1			
F1	F2	F3	F4

Display illustration: AVERAGE adjustment with 4 load cells ADR11 – ADR14 load value

The balancing weight with the black background indicates where the scale must be loaded with the calibration weight (in the center between ADR11 and ADR14). The measured values are accepted with the F1 key (LOAD 1).

The balancing weight is then displayed between ADR12 and ADR13, the scale must be loaded there with the balancing weight. LOAD 2 is displayed above the F1 key. The measured values for this loading point are accepted with F1.

The set scale characteristic curve is calculated. The message "Completed successfully!" appears in the display. This message must be acknowledged with the F4 key.

The off-center load compensation in AVERAGE mode is then complete.

10.6.3 Off-center load compensation mode “PRECISE”

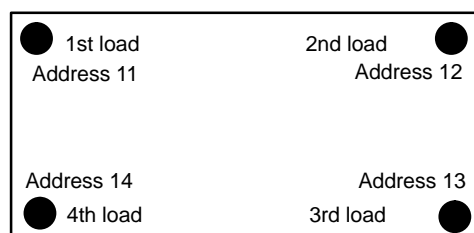


Fig.: Segment 1 with four load cells

Mode: PRECISE

In the adjustment mode “PRECISE”, each load cell is loaded with the calibration weight. Five measured values are acquired for a platform scale with 4 load cells.

Unloaded scale

1. Calibration weight on load cell 11
2. Calibration weight on load cell 12
3. Calibration weight on load cell 13
4. Calibration weight on load cell 14

The load location is displayed in the adjustment menu.

LC CALIBRATION (PECISE) : SEGMENT 1			
Measured value		Measured value	
ADR 11		ADR12	
CHARACTERISTIC CURVE WILL BE RESET !			
Measured value		Measured value	
ADR 14		ADR13	
START			
F1	F2	F3	F4

Display illustration: PRECISE adjustment with 4 load cells ADR11 – ADR14 current value

The 4 load cells with the addresses 11...14 display the measured values of the respective load cells above the address.

Use the F1 key (START) to clear a previous adjustment, the dialog continues with the “UNLOADED SCALE” window. The scale should be unloaded now. The four load cells with the addresses 11...14 display the measured values of the respective load cells for the unloaded scale above the address.

Use the CE key to quit the dialog without clearing the previous adjustment.

LC CALIBRATION (PRECISE) : SEGMENT 1			
Measured value		Measured value	
ADR 11		ADR12	
UNLOADED SCALE			
Measured value		Measured value	
ADR 14		ADR13	
ZERO			
F1	F2	F3	F4

Display illustration: PRECISE adjustment with 4 load cells ADR11 – ADR14 zero value

The four load cells with the addresses 11 ... 14 indicate the measured values for the unloaded scale. The measured values of the corresponding load cells are displayed above the addresses. The measured values are accepted with the F1 key (ZERO).

CALIBRATION WEIGHT (Balancing weight)

LC CALIBRATION (PRECISE) : SEGMENT 1			
Measured value		Measured value	
ADR 11		ADR12	
↑5.000			
Measured value		Measured value	
ADR 14		ADR13	
LOAD 1			
F1	F2	F3	F4

Display illustration: PRECISE adjustment with 4 load cells ADR11 – ADR14 load value
The balancing weight with the black background indicates which load cell must be loaded with the calibration weight. The measured value is accepted with the F1 key (LOAD 1).
The next load cell to be loaded is displayed as ADR12 and the measured value is accepted with F1 (LOAD 2).
Then load ADR13 and accept the measured values with F1 (LOAD 3);
finally load ADR14 and accept measured values with F1 (LOAD 4).
The set scale characteristic curve is calculated. The message "Completed successfully!" appears in the display. This message must be acknowledged with the F4 key.
The off-center load compensation in PRECISE mode is then complete.

10.6.4 Off-center load compensation mode “INPUT”

- Call up “OFF-CENTER LOAD COMPENSATION” parameter menu
- Call up “INPUT SEGMENT 1(2,3)” menu

Segments 2 and 3 are only displayed when 2 or 3 is set in the menu SCALE CONFIGURATION-SEGMENT-NUMBER.

A scale configuration with at least 4 load cells is required for digital off-center load compensation.

The load cells belonging to the selected segment are displayed with their addresses. (E.g. Segment 1 with 4 load cells? Display correction value 11... 14)

To input the correction values, proceed as follows:

1. Display measured value display (exit parameter menu).
2. Load the four corners consecutively with a known weight. Note the weight values.
3. Note the deviation between displayed weight and known weight.
4. Calculate, for each corner, the compensating value based on the scale maximum capacity using the formula
Maximum capacity/known weight * measured deviation.
5. Enter the calculated values for the individual load cells in the parameter menu OFF-CENTER LOAD COMPENSATION / INPUT SEGMENT 1.
6. Check the deviations in the measured value display and adjust where necessary.

Example:

The scale consists of one segment (segment 1)/ The scale maximum capacity is 100 kg (display = 100.00 kg), the known balancing weight is 25 kg. At corner 11, the weight is displayed at 24.90 kg

Calculate the deviation: $24.90\text{kg} - 25.00\text{kg} = -0.10\text{kg}$ (displayed weight – balancing weight)

Convert deviation using nominal value (100.00 kg) = $100.00/25.00 * (-0.10) = -40\text{ kg}$

Input -0.40 kg into parameter menu OFF-CENTER LOAD COMPENSATION CORRECTION VALUE 11.

Proceed in the same way for correction values 12, 13 and 14.

After input check the corners again and repeat the inputs if necessary.

10.7 Multi-range scale

The DIS2116 can be operated as a single-range or multi-range scale.

Two parameters are available in the parameter menu "SCALE PARAMETERS-PARAMETER": MULTIRANGE1 and MULTIRANGE2. The weighing range (NOMINAL VALUE) must be set before this setting.

Scale type	Parameters
Single-range scale	MULTIRANGE1 = MULTIRANGE2 = 0
Dual-range scale	$0 < \text{MULTIRANGE1} < \text{NOMINAL VALUE}$ and $\text{MULTIRANGE2} = 0$
Three-range scale	$0 < \text{MULTIRANGE1} < \text{MULTIRANGE2} < \text{NOMINAL VALUE}$

The increment for the second/third weighing range is automatically derived from the "RESOLUTION" parameter, whereby this parameter always describes the increment of the first measuring range:

Example:

"RESOLUTION" = 1 d → Increment range 2 = 2 d → Increment range 3 = 5 d

10.8 Taking gravitational acceleration into account

The gravitational acceleration and thus the scale display, is dependent on the geographical data of the installation location. The maximum variation between the different regions within the Federal Republic of Germany is 0.1%; worldwide, this is 0.6%.

The function described below allows adjustment to take place on the scale manufacturer's premises, even if the device is to be operated at a different geographical location.

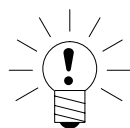
If the fault effect at the new installation location exceeds the scale accuracy limits, it is usually necessary to re-adjust. But instead of this, it is also possible to use an internal correction function in the DIS2116 to compensate for the effect of the installation location.

To do this, input the following in the "SCALE PARAMETERS → PARAMETER menu, (access authorization required!):

- G-FACTOR CALIBRATION = gravitational acceleration factor for the calibration location
- G-FACTOR APPLICATION = gravitational acceleration factor for the destination location (where the scale is used)

This must be input after scale adjustment.

With the setting G-FACTOR CALIBRATION = G-FACTOR APPLICATION, the correction calculation can be disabled. The display is then always related to the location of the last calibration.



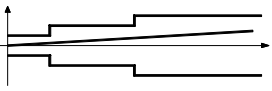
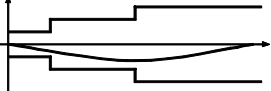
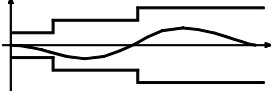
NOTE

This setting is not required if the scale is adjusted in situ!

11 Linearization

For most scale applications, standard adjustment with the zero and full scale values ("INPUT" or "MEAS") is sufficient. The signal only needs to be linearized ("LINEARIZATION") if unacceptable errors occur with this method. Linearization corrects errors when scale structures have an output signal that is not proportional to the weight (e.g. because there are mechanical transmission elements).

Correction selection via the menu "SCALE PARAMETERS → LINEARIZATION:

Calibration steps	Zero value, full scale value ¹⁾	Two additional calibration weights	Two additional calibration weights
Recommended for:	Standard application	Structures with a linearity error	Structures with a linearity error
Possible to correct the following errors:	Error proportional to the measured value	One maximum of the error char. curve	Two maximums of the error char. curve
Example: (Scale output signal error, as per OIML)			

1) Zero and full scale value adjustment is already described in Chapter 10.

For the linearization method, proceed as follows:

- Set the scale parameters
- Calibrate the scale at two points (zero and calibration weight) or via off-center load calibration (Chapter 10 (page 66))
- Measure the linearity error in the weighing range with two additional calibration weights



NOTE







Correction is only possible when performing measurements. Input only makes sense when the linearity adjustment has been implemented and the determined values are reset for test purposes and now need to be input again.

Linearization always takes place at two measurement points (current values). First establish whether the error characteristic curve has one or two maximums (see above).

If the error characteristic curve has one maximum, the first measurement point is put at about 500 d = e (the narrowest part of the error characteristic curve). The second measurement point is put at the maximum of the error characteristic curve.

If the error characteristic curve has two maximums, the first measurement point is put at the first maximum. The second measurement point is put at the second maximum of the error characteristic curve.

The table below shows an extract from the parameter menu:

SCALE PARAMETERS–LINEARIZATION		Access level 4	
	WEIGHT 1		Setpoint input for measurement point 1
	MEASURED VALUE1		The measured value of the scale loaded with weight 1 is displayed and accepted with Enter.
	INPUT MEASURED VALUE 1		If the measured value for weight 1 is known, it can be input again here.
	WEIGHT 2		Setpoint input for measurement point 2
	MEASURED VALUE 2		The measured value of the scale loaded with weight 2 is displayed and accepted with Enter.
	INPUT MEASURED VALUE 2		If the measured value for weight 2 is known, it can be input again here.

Procedure for adjustment:

- The scale is already adjusted in its weighing range
- Any linearization present is disabled
(weight 1 = weight 2 = measured value 1 = measured value 2 = 0))
- Call up "Weight 1" sub-menu
- Input the value for calibration weight 1
- Load the scale with calibration weight 1
- Call up the "Measured value 1" sub-menu , the measured value is displayed with internal resolution
- Wait until measured value display is still
- Press "Enter" to store the value (the first value pair is recorded)
- Call up "Weight 2" sub-menu
- Input the value for calibration weight 2
- Load the scale with calibration weight 2
- Call up the "Measured value 2" sub-menu, the measured value is displayed with internal resolution
- Wait until measured value display is still
- Press the "Enter" key to store the value.

After input and measurement of both interpolation points, the linearization coefficient is calculated. The characteristic curve is linearized.

12 Legal-for-trade applications

Once the scale parameters have been set and the scale adjusted in the "SCALE PARAMETERS" menu, the DIS2116 must be set to legal-for-trade applications (OIML or NTEP) using the parameter menu "Mode → LFT capability". This protects the legal-for-trade parameters in the DIS2116 and load cells against further change and the legal-for-trade counter, which cannot be reset, increases by one. The max. counting volume of the legal-for-trade counter is 9 999 999. The counter has no overflow and is not resettable.

Legal-for-trade counter (TCR) display:

There are two methods for TCR display:

1. Permanently in INFO line 1 or 2 (select parameter menu DISPLAY–DISPLAY LINE 1 or DISPLAY–DISPLAY LINE 2 TCR)
2. In the scale label (key F1 when "i" is displayed in the function line, switch function line with F4)

TCR stands for "Trade Counter" .



NOTE

The DIS2116 does **not** check whether the parameter settings made are valid under OIML R76 or NTEP!

Before leaving the "MODE" menu, the parameter access authorization parameter menu "MODE–ACCESS LEVEL" must be appropriately set.

ACCESS Parameter:

The various menu levels have so-called access authorizations. The "MODE → ACCESS LEVEL" parameter is used to define the access for changing parameters. The level with the most restrictions is zero. This feature is used to restrict user access to these parameters. The "MODE → ACCESS LEVEL" parameter is protected by the hidden pushbutton. The applicable access level is given for each parameter in the parameter description.

ACCESS parameter	Enabled access levels
0	0 only
1	0 and 1
2	0 to 2
3	0 to 3
4	0 to 4
5	All, HBM setting

LFT parameters in the main menu:

Access level	Main menu level	Explanation	Legal-for-trade parameters ¹⁾
0	INFORMATION	Information	–
1	PRINT	Printing	–
2	LIMIT VALUES	Limit values	–
4	FILTER	Filter	–
4	COMMUNICATION	Interface settings	–
3	PRINT PROTOCOL	Print protocol settings	–
4	CLOCK	Real-time setting	–
4	FUNCTION KEYS	Function key assignments	Yes
4	DISPLAY	Setting Info line 1 and 2 contents, contrast	–
0	FUNCTION TEST	DIS2116 test functions	–
0	MODE	Basic scale functions	Yes
5	SCALE CONFIGURATION	Segments, load cells	Yes
5	SCALE PARAMETERS	Basic scale functions	Yes
5	OFF-CENTER LOAD COMPENSATION	Off-center load error compensation	Yes
5	FACTORY SETTINGS	Restores the factory settings	Yes


¹⁾ Access only via hidden pushbutton

When you now exit the "MODE" parameter menu, all the legal-for-trade parameters are protected (display only, changes cannot be made).

The legal-for-trade counter can be read in the "INFORMATION → SCALE" menu (Chapter 8.5.1, page).

Fill out the supplied insertion strip in accordance with the set application and insert in the front foil. Attach the calibration label to then secure the hidden switch and the insertion strip.

The calibration label is applied according to the applicable national regulations.

The parameter menu can now only be called up via the  key.

If the scale has to be re-adjusted or new parameters have to be set that are relevant to calibration, proceed as follows:

- Remove the calibration label and the insertion strip
- Call the parameter menu via the hidden key
- Change the "MODE → LFT CAPABILITY" parameter to NO
- The "MODE → ACCESS LEVEL" parameter must be set to five.

Setting the parameter to legal-for-trade applications produces the following display and tare ranges:

MODE → LEGAL-FOR-TRADE	Display, lower limit value	Display, upper limit value
NO (not legal-for-trade)	–160 %	160 %
OIML	–2 %	Nominal value + 9 d
NTEP	–2 %	105 %

MODE → LEGAL-FOR-TRADE	Tare range, lower limit	Tare range, upper limit
NO (not legal-for-trade)	–100 %	100 %
OIML, NTEP	>0	100 %

MODE → LEGAL-FOR-TRADE	Range of zero setting, lower limit	Range of zero setting, upper limit
NO (not legal-for-trade)	– 20 %	+ 20 %
OIML, NTEP	– 2 %	+ 2 %

The % figures relate to the nominal weighing range ("SCALE PARAMETERS → PARAMETER →NOMINAL VALUE" menu).

The scale electronics must be labeled and sealed in accordance with the scale application. Different labeling strips are included for use as a Class III and IIII non-automatic scale. The labeling strip must contain at least the following data:

- Max** Maximum scale loading
- Min** Minimum scale loading
- e** Increment
- Type** Name of scale
- S.N.** Individual serial number of scale




In the case of legal-for-trade scales, verification must be performed by a notified body, in accordance with current national laws. The sealing and calibration labels must be attached in accordance with the approval.


13 Vehicle scale

In the “VEHICLE SCALE” operating mode, all functions required for weighing vehicles are activated.

- Additional vehicle weighing functions on keys “F1” to “F4”
- Database for storage of vehicle data, material, procedure. Max. 65.000 vehicles can be stored.
- “Yard list” for vehicles checked in with Weighing1 but which have not yet checked out (Weighing2). The “yard list” includes max. 50 vehicles.
- Functions for creating and editing vehicle data
- Storage of weighing results with Weighing1(2), tare, vehicle data, date and time

13.1 Activate “VEHICLE SCALE” operating mode

Access:  Key: **MODE**  **OPERATING MODE**  (Enter)


Sub-menu explanation			
	OPERATING MODE		Standard*
			Vehicle

If the DIS2116 has been set to legal-for-trade applications (OIML, NTEP), the operating mode cannot be changed.

When the DIS2116 is set to vehicle scale with “MODE–OPERATING MODE–VEHICLE”, the F1 to F4 function keys are assigned additional functions for vehicle weighing. The assignment of keys F1 to F4 for vehicle weighing are displayed in the measured value display function line by pressing F4 several times.


In the vehicle scale setting, there are three switchable function lines which can be selected with the F4 key.

Function line for vehicle weighing

F1  Database	F2 →] Vehicle list	F3 [→ Yard list	F4 ↓ Level 1 Scroll to Level 2
--	---------------------------------	------------------------------	--

13.2 Edit database

Press F4 until this function line appears

	→]	[→	↓	Function line
F1	F2	F3	F4	Keys
Database	Vehicle list Check-in	Yard list Check-out	Scroll to Level 2	

The vehicle list is selected by pressing F1.

Note: Each time F1 is pressed, the mode switches between *Edit database* and *Vehicle selection*.

Vehicle list: The following window appears on the screen:

Display illustration: Vehicle list

Truck list – total			
Search:			
Truck	Goods	Procedure	Date
F-RA 123	Gravel	Pickup	10.09.08
.....	
↵	↓	↑	←x
F1	F2	F3	F4

A maximum of 10 characters can be entered in the columns Truck, Goods and Procedure. The date cannot be entered, the last date on which the vehicle data was edited is displayed.

- Vehicle search

There are two ways to search for a vehicle in the Truck list:

1. Search with keys ↓(F2) ↑(F3)

The F2 key is used to search the entries in the “Truck” column alphabetically from A→Z and F3 key from Z→A. The applicable vehicle is indicated by a black bar.

2. Search using text

Use the keyboard to enter the number plate of the vehicle being sought. The search starts with the first character entered. The first number plate that starts with this character is now displayed in the first line under “Truck” and is marked by a black bar. The search is refined with every additional character that is entered.


If there is no vehicle that starts with the entered letter, the next vehicle is shown that starts alphabetically with the letter after that entered.

The search text can be deleted with the F4 key (←x). The vehicle display changes to match the remaining search text. If the search text is completely deleted, the first vehicle in the list is displayed alphabetically.



directly opens the editor window of the selected vehicle, see Editing vehicle data.







13.2.1 Editing vehicle data

The F1  key switches the function line mode between “Find vehicle” and “Edit vehicle”.
Display illustration: “Edit vehicle data” function line

		<u>X</u>	
---	---	----------	---

Press the F2 key to open the editor window for the selected vehicle (marked with a black bar).




Display illustration: Editor window

Truck list 			
Truck	:	F-RA 123	
Goods	:	Gravel	
Procedure	:	Pickup	
Emptyw.	:	10.000 t	
Max. weight	:	15.000 t	
Min. weight	:	10.100 t	
			 X

F1 moves the cursor to the required line
F2 moves the cursor left, F3 right
F4 deletes the line character by character from the right
The unit cannot be deleted, it corresponds to the unit set in the parameter menu “SCALE PARAMETERS-PARAMETER”.

13.2.2 x Delete vehicle


The F1  key switches the function line mode between “Find vehicle” and “Edit vehicle”.





		<u>X</u>	
F1	F2	F3	F4

Display illustration: Edit vehicle data function line


Press the F3 (X) key to delete the selected vehicle (marked by a black bar) from the database.

13.2.3 Create vehicle


The F1  key switches the function line mode between “Find vehicle” and “Edit vehicle”.

			
F1	F2	F3	F4

Display illustration: “Edit vehicle data” function line

Press the F4 () key to open an empty editor window. The entries can be made here as described in Point 13.2.1 “Edit vehicle data”.

The entered data is stored with the  key. An empty window cannot be saved.

Use the  key to close the window without saving the data.





13.3 Vehicle weighing mode Check-in/Check-out

In the vehicle weighing mode Check-in/Check-out, the weight determination for the load is based on 2 measurements. The weight of the arriving truck is recorded with Weighing1 and the weight of the departing truck with Weighing2. The difference is the weight of the loaded or unloaded material.

It is also possible to use the empty weight (pretare) stored with the truck data as the weight for the arriving truck. The arriving truck then does not need to drive onto the scale.


Arriving vehicle

Press F4 until this function line appears

				Function line
F1	F2	F3	F4	Keys
Database	Vehicle list Check-in	Yard list Check-out	Scroll to Level 2	

F2 opens the vehicle list which contains all stored vehicles.

Use the arrow keys (F2), (F3) or the search text to select the applicable vehicle or create a new one with F1 (Chapter 13.2.1 or 13.2.3).

The  key confirms the selection. The measured value window with the current measured value is displayed. The weight of the arriving vehicle is recorded in the window "Weigh1".

Weigh1

Record measured value?

10.535 t

Pretare			
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F1 is used to accept the stored empty weight (pretare) without having the vehicle stand on the scale.





The displayed weight is accepted with F4.

After check-in of the vehicle, it is entered into the list of the accepted vehicles, the so-called "yard list".

This completes the check-in procedure.


Departing vehicle

Set the function line displayed here with F4.

				Function line
F1	F2	F3	F4	Keys
Database	Vehicle list Check-in	Yard list Check-out	Scroll to Level 2	

F3 opens the vehicle list (yard list) which contains all arrived vehicles.


Use the arrow keys (F2), (F3) or the search text to select the applicable vehicle.

The  key confirms the selection. The measured value window with the current measured value is displayed. The weight of the departing vehicle is recorded in the window "Weigh2".

Weigh2

Record measured value?

11.535 t

			
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The displayed weight is accepted with F4. After the weight of the departing vehicle is recorded with Weigh2, the vehicle is deleted from the yard list.

The weighing result and the weight during check-in and check-out are stored together with the vehicle number plate, date and time, plus a sequential print number on the SD card and can be viewed in the parameter menu INFORMATION-WEIGHING RESULT (Chapter 8.5.1, page 40).

This completes the weighing process for a vehicle.


The weighing result can be displayed on a second display (COM4) and printed out on a printer (Chapter 14, page 92).

14 Print function




A printer can be connected to the serial interface COM3 (RS-232) or the USB printer interface of the DIS2116 to print out the weight values.

14.1 Activating the printer interface

Access: Key  , **COMMUNICATION**  **PRINTER**  (Enter)

Sub-menu explanation				
	FUNCTION		Selecting the printer interface	
			OFF	COM3 and USB disabled
			ON (COM3)	Serial printer connection active (RS232)
			ON (USB)	USB printer connection active

If the USB printer interface is used, no further settings are necessary, the following menu is only displayed when COM3 is selected as the serial printer connection.

Sub-menu explanation				
	BAUD RATE		The following baud rates can be set: 1.2k, 2.4k, 4.8k, 9.6k, 19.2k, 38.4k, 57.6k and 115.2k Bd	
	PARITY		The following settings can be selected for parity: None – Even – Odd	
	PROTOCOL		The DIS2116 has two transmission protocols to the printer DTR = Hardware protocol controlled via the DTR signal DC1 = Software protocol controlled with DC1/DC3	

* Factory settings

14.2 DIS2116 – printer connection

The DIS2116 is equipped with a serial printer output COM3 and a USB printer connection. The interface selection is described in Chapter 8.5.5., page 45.



Printer connection

COM3 Standard printer cable, 9–pin SUB-D. The assignment of the COM3 interface is described in Chapter 5.10, page 25.

USB Standard USB cable


14.3 Print protocol selection


The Print function is only accessible if COM3 or USB is activated for printing.



Sub-menu explanation				
PRINT			Access level 4	
	MEASURED VALUE		Selection of print protocol Prt01 to Prt05	
	PARAMETER		SCALE PARAMETERS	Printout of load cell parameters
			DIS2116 PARAMETERS	Printout of DIS2116 parameters
			BUSSCAN RESULT	Printout of load cells connected to the DIS2116

* Factory settings

14.4 Start printing

- With F1 in the measured value display when the symbol for printing  is displayed above F1.

The symbol  is only displayed when the function is set to ACTIVE in Parameter menu – Function keys – Print

If the symbol  is not displayed above F1, press F4 to change the assignment of the function keys until the  print symbol is displayed.

What is printed out depends on the operating mode of the scale and always corresponds to what is shown on the display. Printing only takes place when there is standstill, so the unit of measurement is always printed out. With non legal-for-trade applications, printing can take place as often as required.

With a legal-for-trade setting, the printout cannot be repeated. There must be a change in weight and a renewed standstill before there can be a new printout. There is no printing outside the display limits.

Every measured value printout and print protocol PRT01 is stored in the ALIBI memory on the SD card.

14.5 Different print protocols

- Prt01 MV: Gross or NET and Tare
- Prt02 MV1: Gross or NET Weighing1 and Tare for vehicle scale
- Prt03 MV2: Gross or NET Weighing2 and Tare for vehicle scale
- Prt04 Total: Gross or NET Weighing1 Weighing2 Result (Weighing2 – Weighing1) and Tare for vehicle scale
- Prt05 Result: Gross or NET Result (Weighing2 – Weighing1) and Tare for vehicle scale

Protocol Prt01 MV:

User-defined line 1			
User-defined line 2			
User-defined line 3			
Date	:	xx.xx.2xxx	
Time	:	xx.xx	
Scale ID	:	xxxxxxx	
Printout No.	:	xxxxxxx	
Weight	G	xxx.xx	kg
Weight	N	xxx.xx	kg
Tare	:	xxx.xx	kg
Tare PT	:	xxx.xx	kg

The first three lines (Identstring 1..3) can be input via the
Parameter menu – Print protocol User-defined line 1 (2..3)

- Via the membrane keypad
- Via an external keyboard which can be connected via the PS2 input
- Via the computer interface COM2 (see *Manual Part 2*, Command **PS1,PS2,PS3**)

Any content, up to a maximum of 30 characters in each case, can be stored here. These three strings are inactive by default and the lines are not printed out.

The scale ID line is the production number of the scale (given by the manufacturer).

The printout No. is a sequential number which is increased with each printout.

In the weight line, only the line with the gross value (G) or the net value (N) is printed out. In the Tare line, only the tare value or the manual tare value (PT) is printed out.

Protocol Prt04 Total:

User-defined line 1				
User-defined line 2				
User-defined line 3				
Date	:	xx.xx.2xxx		
Time	:	xx.xx		
Scale ID	:	xxxxxxx		
Printout No.	:	xxxxxxx		
Truck ID	:	DA-HM 123		
Goods ID	:	xxxxxxxxxx		
Operation ID	:	xxxxxxxxxx		
Weight1	G	:	xxx.xx	kg
Tare1		:	xxx.xx	kg
Tare1 PT		:	xxx.xx	kg
Weight2	N	:	xxx.xx	kg
Tare2		:	xxx.xx	kg
Tare2 PT		:	xxx.xx	kg
Result	N	:	xxx.xx	kg

Supplementary to protocol Prt01 MV, this protocol contains the vehicle data, a procedure ID and the empty vehicle (Weight1) and the loaded vehicle (Weight2).

15 Interface for a second display









An external, second display can be connected to COM port 4 (RS232). The connection of COM4 (9 pin SUB-D) is described in Chapter 5.8 (page 24).

15.1 Activating COM4 for a second display

Access: Key  , **COMMUNICATION**  **EXT. DISPLAY**  (Enter)

COMMUNICATION – EXT. DISPLAY
(COM4)

Access level 4

	FUNCTION		OFF* – COM4 disabled Selection of display strings String 1 to String 5
	STANDARD-DISPLYA ¹⁾		– none microSYST MIGRA (numeric display) microSYST MIGAN (graphic display)
	PROTOCOL		The DIS2116 has two transmission protocols for the Ext. display OFF* = No handshake DTR = Hardware protocol controlled via the DTR signal DC1 = Software protocol controlled with DC1/DC3
	BAUD RATE		The following baud rates can be set: 1.2k, 2.4k, 4.8k, 9.6k*, 19.2k, 38.4k, 57.6k and 115.2k Bd
	PARITY		The following settings can be selected for parity: NONE EVEN ODD
	START STRING LENGTH		0* = No start string 1...15 character start string
	Character 1 ²⁾character 15		Input of any ASCII character as decimal value
	END STRING LENGTH		0* = No end string 1...5 character end string

The checksum CRC is a XOR operation of all transmitted characters (first start string character to last end string character).

Detailed description

Char.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
String1	SN	M1	M1	M1	M1	M1	M1	M1	M1	ES	U	U	U	U
String2	SN	M1	M1	M1	M1	M1	M1	M1	M1	ES	U	U	U	U
String3	SN	W1	W1	W1	W1	W1	W1	W1	W1	ES	U	U	U	U
String4	SN	M1	M1	M1	M1	M1	M1	M1	M1	–	–	–	–	–
String5	SN	M1	M1	M1	M1	M1	M1	M1	M1–	S1	S2	S3	ES	U

Char.	15	16	17	18	19	20	21	22	23	24	25	26	27	28
String1	ES	GN	GN	GN	GN	–	–	–	–	–	–	–	–	–
String2	ES	GN	GN	GN	GN	SN	T1	T1	T1	T1	T1	T1	T1	T1
String3	ES	GN	GN	GN	GN	–	–	–	–	–	–	–	–	–
String4	–	–	–	–	–	–	–	–	–	–	–	–	–	–
String5	U	U	U	–	–	–	–	–	–	–	–	–	–	–

* If no decimal separator is set (CMD_KC4=0), the characters are offset

SN Sign '–' or empty space

M1 Measured value* (7/8 characters)

W1 Weighing result* (7/8 characters)

T1 Tare value* (7/8 characters)

ES Empty space

U Unit (4 characters)

GN Gross/Net display ('G', 'NET', 'N PT') at standstill, otherwise empty space (4 characters)

S1 Gross/Net display ('G', 'N') (1 character)

S2 Standstill display ('M') or empty space (1 character)

S3 Weighing range ('1', '2', '3') or empty space (1 character)




NOTE





The length of the values M1, W1 and T1 depend on whether a decimal separator has been set.

16 Limit values

The DIS2116 has two programmable limit values. Each channel becomes active when the activation value is exceeded and inactive when the deactivation value is undershot. The different values give a free choice of hysteresis. The values can be related to the gross or the net weight as desired; this is not dependent on the current display mode.

The parameters for the limit value switches are described in Chapter 8.5.3 (page 42).

Active limit value channels are displayed by the symbols ( 1,2) in the status line of the display.

 1	Limit value 1 active, limit value 2 not active or off
 12	Limit value 1 and 2 active
 2	Limit value 1 not active or off, limit value 2 active
	If this symbol is not displayed, no limit values are active

17 Alibi and calibration memory

The DIS2116 is equipped with an SD card to store the legal-for-trade parameters. The main print protocol information is stored on the SD card during every printout. The data is stored encrypted on the SD card.

Storage is implemented irrespective of whether it is a legal-for-trade application or if a printer is connected.

The following data are stored during printing (F1 when the symbol  is displayed):


Print number, date, time, gross, net and tare values, decimal point, unit, measured value status

If vehicles are weighed, the vehicle number, goods, procedure ID, check-in weight and check-out weight are also stored.

The SD card is only accessible after the housing has been opened. In legal-for-trade applications, the housing is prevented from being opened by an adhesive label.

17.1 Reading the stored files

The stored data can be displayed via the parameter menu "INFORMATION – WEIGHING RESULT". The required result can be found and displayed with the arrow keys F2 (↓) or F3 (↑), or by inputting the print number.

To search via the print number, use the keyboard to enter the print number you are looking for. Press the F4 key to delete the search text. Start the search with the (Enter)  key.



NOTE

Print data and time are only correct if the real time clock has previously been set.

17.2 SD memory card

The DIS2116 is delivered with an installed memory card with a capacity of 1 GByte.

Maximum SD card memory capacity:	2 GByte
Maximum number of alibi print data	in a 1GB SD card: 7,5 million
	in a 2GB SD card: 15 million
Maximum number of data records in the vehicle database:	65 000
Maximum number of vehicles in yard list:	50



NOTE

Error No. 9123

Maximum number of alibi print data exceeded SD card full, no further alibi print data can be saved. Alibi print data **cannot** be deleted!

In legal-for-trade mode, the DIS2116 will initially no longer continue to operate with anything other than the installed SD card. In order that the device can operate again with the new SD card, the hidden pushbutton (secured with the verification seal) must be pressed. The verified mode is left and the legal-for-trade counter is increased by 1.

What to do if the device or the SD card is defective?

1. Open housing
2. Remove SD card
3. Insert SD card in new device
4. Close housing
5. Switch on the device
6. Press the hidden pushbutton
7. Set the required settings again in the menu MODE/LEGAL-FOR-TRADE CAPABILITY.

In the case of legal-for-trade use, national legal and safety regulations must be complied with.

What to do if the SD card defective (device legal-for-trade):

1. Remove seal
2. Open housing
3. Replace SD card with new SD card
4. Fixing of the exchanged SD card with an adhesive strip against slipping or sliding out by shaking
5. Close housing
6. Switch on the device, the SD card is initialized with default data (Alibi data and vehicle data are lost)
7. Proceed as described in Chapter "4.1 Initial commissioning"

After commissioning is complete:

8. Press the hidden pushbutton and execute the function CONFIGURE in the menu SCALE CONFIGURATION
9. Press the hidden pushbutton again and set the required settings in the menu MODE / LEGAL-FOR-TRADE CAPABILITY

In the case of legal-for-trade use, national legal and safety regulations must be complied with.

**NOTE**

After all adjustments and settings have been made, we recommend that you copy the SD card data. This enables data to be easily transferred to the replacement card in the event of a defect in the card.

18 Graphic display

The measured value curve is displayed graphically in the graphic display.

The measured value from a load cell, segment or a scale consisting of several segments can be displayed.

Another function of the graphic display is the determination and graphical display of the scale center of gravity. The center of gravity can be determined if the scale consists of at least 3 load cells.

18.1 Oscilloscope

The measured value from a load cell, segment or a scale consisting of several segments can be graphically displayed in the oscilloscope function.

Access: Key **PAR** , **INFORMATION** **GRAPHIC** **OSCILLOSCOPE** (Enter)



Various measured values can be displayed in the oscilloscope window. The measured values recording runs continuously and is stopped with F1 (MENU). If the CE key is pressed, the recording will be continued.

Press F1 MENU key for two selection options:

F1 FOCUS	(Zoom function)
F2 MEASURED VALUE	(Measured value selection)

- F1 FOCUS


This function can be used to look at a section of the recorded measured values. To do this, position CURSOR 1 with the keys F1, F2 at the start and CURSOR 2 with the keys F3, F4 at the end of the area of interest. The measured values along the Y axis will be zoomed in on. The MAX value and the MIN value of the section observed will be displayed on the Y axis.

Return to the entire recording by placing CURSOR 1 on the left edge and CURSOR 2 on the right edge.

Use CE to leave the FOCUS function and reset the CURSOR 1 (2) so that when F1 is pressed again, they will be positioned on the left and right edges.

- F2 MEASURED VALUE

Keys F1 and F4 can be used to select various measured values and display them in the line graphic.

1. Select the required signal (measured value) with F1 and F4 and confirm with .
2. Leave the measured value selection menu with CE.

The selected signal will be displayed in the recording window in the upper right corner. The abbreviations:

M = Measured value of the scale

S: 1..3 = Segment with segment number

A:11 = Signal of a single load cell indicated by the address

18.2 Center of gravity

The center of gravity of a loaded scale is displayed. The scale must consist of at least 3 load cells to display the center of gravity.

Access: Key , **INFORMATION**  **GRAPHIC** 
CENTER OF GRAVITY  (Enter)

Display illustration: Center of gravity

ADR 11	ADR 12
X	
ADR 14	ADR 13

Center of gravity display for a scale consisting of 1 segment and 4 load cells. The individual load cells are displayed with their addresses; in this example segment 1 with the addresses 11 14. The determined center of gravity is marked by an "X". "Error" is displayed if the scale platform is lifted.

No center of gravity is determined with a load of $< 1\text{ d}$, the message "No load" is displayed.



NOTE

To ensure that the center of gravity determination works correctly, the load cell addresses must be assigned clockwise during scale configuration as shown in the center of gravity determination example above. If the scale consists of several segments, the load cell arrangement must be implemented the same way in each segment.

ADR 11	ADR 12	ADR 21	ADR 22	ADR 31	ADR 32
Segment 1		Segment 2		Segment 3	
ADR 14	ADR 13	ADR 24	ADR 23	ADR 34	ADR 33

Fig.: Address assignment for 3 segments

ADR 11	ADR 32
X	
ADR 14	ADR 33

Fig.: Center of gravity determination with 3 segments as a compound scale

Only the outer 4 load cells are shown in the center of gravity window.

19 Parameter factory settings

When the DIS2116 is delivered, it comes with specific factory settings:

- The (7-digit) production number is entered

As the DIS2116 has undergone certain tests during production, the following information can deviate from zero:

- Legal-for-trade counter (Menu "INFORMATION SCALE" or F1 key with symbol i)
- Sensor-overflow counter (Menu "INFORMATION BUSSCAN")

Parameter	Default value	Explanation
Limit values 1...2		Deactivated
Filter mode	0	Standard filter
Filter	5	0.3 Hz (AD104C, C16i)
Manual tare value	0	Deactivated
COM1, baud rate	38400	
COM1, parity bit	even	
COM2,COM3,COM4, Function	OFF	Deactivated
COM2,COM3,COM4,baud rate	9600	
COM2,COM3,COM4,parity bit	even	
Printing, ESC sequences	0	Deactivated
Basic scale function	Standard	Non-automatic scale
Menu access	5	All menus
Legal-for-trade operation	OFF	Deactivated
Unit	OFF	No unit of measurement
Zero on start-up	OFF	Deactivated
Zero tracking	OFF	Deactivated
Standstill monitoring	OFF	Deactivated
Increment	1d	
Decimal point	0	right
Maximum capacity	10000	
Multi-range scale	0	Deactivated
Calibration weight	10000	Max. capacity adjustment
Gravitational acceleration correction	9,8102	Deactivated
Scale char. curve, zero	0	
Scale char. curve, nom. value	10000	At load cell maximum capacity
Linearization		Deactivated

When restoring the factory settings ("FACTORY SETTINGS DIS2116" menu), the parameters described above are set to their default values.

20 Monitoring functions and error messages

20.1 Monitoring functions

The following monitoring functions are implemented for load cell connection:

- Detecting whether a load cell is connected to COM1
- Detecting failure of a load cell
- Sensor input signal exceeds the range –160 %...+160 % of the maximum capacity (NOMINAL VALUE)

There are also other monitoring functions available:

- Short circuit of output voltages OUT1 and OUT2
- Error in parameter storage (SD card)

Error message display:

To indicate an error, [Erxxxx] appears on the display for 3 s (Erxxxx is the error code). The last ten errors can also be read in the parameter menu ("INFORMATION ERROR LIST").

Error message	Meaning	Remedy
Display shows -----	Measured value outside the max. display range (depending on the set scale standard)	Reduce scale loading. Check set max. capacity: NOMINAL VALUE parameter in menu "SCALE PARAMETERS-PARAMETER".
Display shows XXXXXXXXXX	Verification error Serial number of LC not identical with verification TRC status in LC not identical with verification	Load cells were replaced or adjusted. Scale must be verified again.

LC = load cell or AD104C

20.2 Error messages

The error code is subdivided into different sections:

Error code	Description
Err xxxx	Error message in display
Error group	(First character)
1	Busscan
2	Load cell initialization
3	Load cell parameter check
4	No function
5	Measurement
6	Off-center load compensation
7	Database
8	COM1/2/3/4 interfaces
9	Hardware

BusScan		
Error code	Description	Remedy
10xx	Error BusScan ADRxx no response (time_out) E.g. 1011 error at address 11 (Segment1 No.1),	Check production number in configuration menu, then carry out busscan, check cables, check load cell interfaces, check DIS2116 interface
11xx	Error BusScan ADRxx incorrect response (NAK) E.g. 1011 error at address 11 (Segment1 No.1),	

Init_Load cells		
Error code	Description	Remedy
2000	FMD error	Carry out busscan or test load cells (Test menu)
2001	ASF error	
2002	LIV1 error	
2003	LIV2 error	
2004	TAS1 error	
2005	TAV0 error	
2006	MRAO error	
2007	CWT1000000 error	
2008	MTD0 error	
2009	ENU"d " error	
2010	ZSE0 error	
2011	ZTR0 error	
2012	HSM0 error	
2013	DPT0 error	
2014	NOV1000000 error	
2015	COF8 error	
2016	LIC0,1000000,0,0 error	
2017	CSM2 error	
2018	NTF error	
2019	RSN1 error	
2020	ICR0 error	

Test_Load cells		
Error code	Description	Remedy
30xx	Error IDN PART1 (Manufacturer_code), ADRxx	Reload load cell with parameters (Menu Adjust/Repair) or replace load cell
31xx	Error IDN PART3 (F number), ADRxx	
32xx	Error read TCR?, ADRxx	
33xx	Error LFT, ADRxx	
34xx	Error LDW/LWT, ADRxx	
35xx	Error read SZA/SFA, ADRxx	
36xx	Error CRC, ADRxx	
37xx	Error Type, ADRxx	
38xx	Error GCA, ADRxx	
39xx	Error GDE, ADRxx	

Measurement		
Error code	Description	Remedy
50xx	Load cell with address xx not supplying measured value	Carry out busscan or test load cell (Test menu), emergency operation possible if only one load cell fails per segment
51xx	Load cell with address xx has incorrect F number	Reload load cell with parameters (Menu Adjust/Repair) or replace load cell
52xx	Load cell with address xx has incorrect TRC status	Reload load cell with parameters (Menu Adjust/Repair) or replace load cell
5701	Vehicle empty weight > Weighing2 result	Check vehicle data Repeat measurement if necessary
5702	Weighing result < minimum vehicle weight	Adjust minimum vehicle weight Vehicle loaded
5703	Weighing result > maximum vehicle weight	Adjust maximum vehicle weight Vehicle overloaded
5801	Measurement invalid	Printout measured value at 0 Printout 2x same measured value
5802	No standstill	Standstill conditions not applicable during measured value printout

Off-center load compensation		
Error code	Description	Remedy
6001	Measured value differences in corners too large	Check scale construction
6002	Zero point outside off-center load range cannot be compensated	
6003	Nominal value outside off-center load range cannot be compensated	

Database		
Error code	Description	Remedy
7001	Yard list full (50 entries)	
7002	Database error	Repair database (Menu FACTORY SETTINGS–DATABASE)

COM1–4 interfaces		
Error code	Description	Remedy
8x01	Input buffer overflow	Carry out a BUSSCAN
8x02	Overrun Possible causes: Incorrect baud rate, parity settings	
8x03	Parity error Possible causes: Incorrect baud rate, parity settings	Carry out a BUSSCAN
8x04	Framing error Possible causes: Incorrect baud rate, parity settings	
8x05	Framing error Possible causes: Incorrect baud rate, parity settings	
x represents the interface e.g. 8101 error at COM1, 8201 error at COM2, etc.		

Hardware		
Error code	Description	Remedy
9100	SD card error	Replace SD card
9123	SD card is full. It is not possible to store further Alibi print data.	
9200	EEPROM error	
95xx	Error ESR, BIT2 (ADC OVFL), ADRxx	Replace load cell
96xx	Error ESR, BIT3 (EEPROM), ADRxx	
97xx	Error ESR, BIT4 (Excitation voltage), ADRxx	
98xx	Error ESR, BIT5 (parameter input), ADRxx	Test load cell (Test menu)

The battery is only important for the real-time clock function. The device also works without a battery. In this case, the date and time have to be reset after a power failure (see Chapters 8.5.6. (page 48)).

21 Specifications

Type		DIS2116
NAWI (non automatic weighing indicator)		
Voltage supply UB		
Range	V_{DC}	10...30 (24 nominal)
Power consumption (without outputs)	W	0.88
Current consumption (with 24 V)	mA	40
Load cell connection		RS485 interface COM1
Supply voltage OUT1	V_{DC}	10...30
Output current	A	<1
Supply voltage OUT3 (C16i)	V_{DC}	10...17
Output current	A	<1
Maximum cable length	m	see table in the annex to the specifications
Display		
LCD with backlighting and status symbols	Pixel	240x64
Character height (measured value)	mm	8
Output rate	/ s	5
Keys		
Number		15
Function keys		4
Serial interface (COM1), Load cells		
Baud rate	Bd	9600,...,115200
Parity bit		even
Data bits	Bit	8
Stop bit	Bit	1
Type		RS485 (2/4-wire)
RS485, 2-wire, signals		TRxA, TRxB
RS485, 4-wire, signals	–	TRA, TRB, TXA, TXB
Max. cable length RS485	m	500
Serial interface (COM2), PC/PLC		
Baud rate	Bd	1200,...,115200
Parity bit		Even, odd, none
Data bits	Bit	8
Stop bit	Bit	1
Type		RS232
RS232, signals		RxD, TxD, GND
Max. cable length RS232	m	25

Serial interface (COM3), Printer		
Baud rate (RS232)	Bd	1200,...,115200
Parity bit (RS232)		Even,odd,none
Data bits (RS232)	Bit	8
Stop bit (RS232)	Bit	1
Type		RS232
RS232, signals		RxD, TxD, GND,DTR
Max. cable length RS232	m	25
USB (COM3), Printer		
Max. cable length	m	5
Printer language		PLC
Serial interface (COM4), Second display		
Baud rate	Bd	1200,...,115200
Parity bit		Even,odd,none
Data bits	Bit	8
Stop bit	Bit	1
Type		RS232
RS232, signals		RxD, TxD, GND,DTR
Max. cable length RS232	m	25
PS2 interface, stand. keyboard		
Output current	mA	< 100
Ambient conditions		
Temperature range		
Nominal temperature range	°C [°F]	–10...+50 [14...122]
Operating temperature range	°C [°F]	–20...+60 [–4...140]
Storage temperature range	°C [°F]	–30...+80 [–22...176]
Relative humidity, non-condensing in operation	%	20...85
Storage	%	10...90
DIS2116 housing		
Degree of protection per EN 60529 (IEC 529)		IP20
Degree of protection per EN 60529 (IEC 529) for front panel when installed		IP65
Material		Aluminum
Weight, approx.	g	540

The DIS2116 is not sensitive to HF irradiation and conducted interference in accordance with OIML R 76, EN 45501:1992(B3), EN 61326: 2006 emission (EME) class B, Immunity from interference: industrial environment.

Maximum cable lengths¹⁾ between DIS2116 and C16i load cell(s)

If the supply voltage of the DIS2116 is less than 17 V, the digital load cells can be directly supplied from the scale electronics. Please note the below table for dimensioning. With a nominal (rated) supply voltage of 24 V, the load cells require a separate voltage supply.

		Nominal (rated) voltage 12 V _{DC}			Nominal (rated) voltage 15 V _{DC}		
		Core cross section (mm ²)					
		0.14	0.25	0.5	0.14	0.25	0.5
Number of load cells	Total Power consumption (mA)	Cable length (m)					
1	50	393	500	500	500	500	500
2	100	197	350	500	315	500	500
3	150	131	234	468	210	375	500
4	200	98	176	351	157	281	562
6	300	66	117	234	105	187	375
8	400	49	88	176	79	140	281
10	500	39	70	140	63	112	225
12	600	33	59	117	52	94	187
16	800	25	44	88	39	70	140

¹⁾ Cable length up to max. 500m.

22 Dimensions (in mm; 1 mm = 0.03937 inches)

22.1 DIS2116 and cutout in the panel-frame

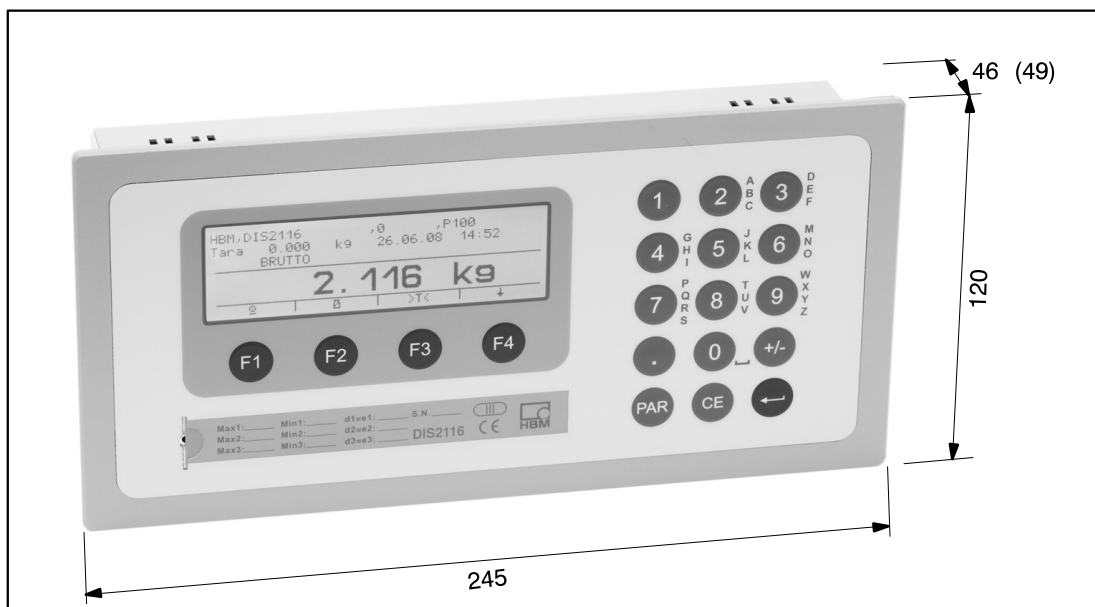


Fig. 22.1: DIS2116 – Dimensions

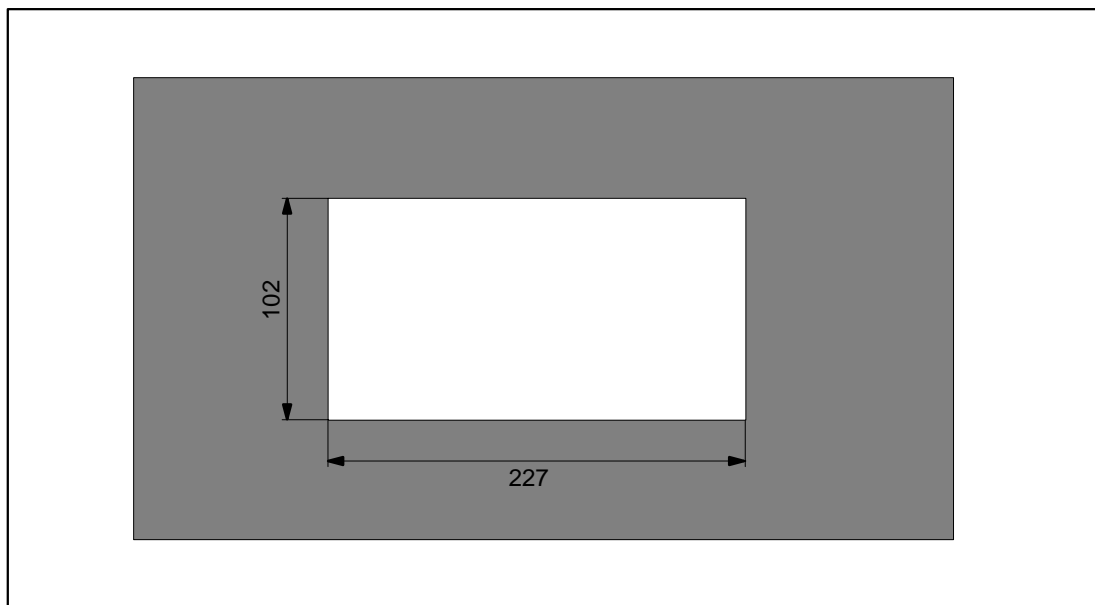


Fig. 22.2: Dimensions for the cutout in the panel-frame

22.2 Desktop housing, also for wall mounting (1-TG2116)

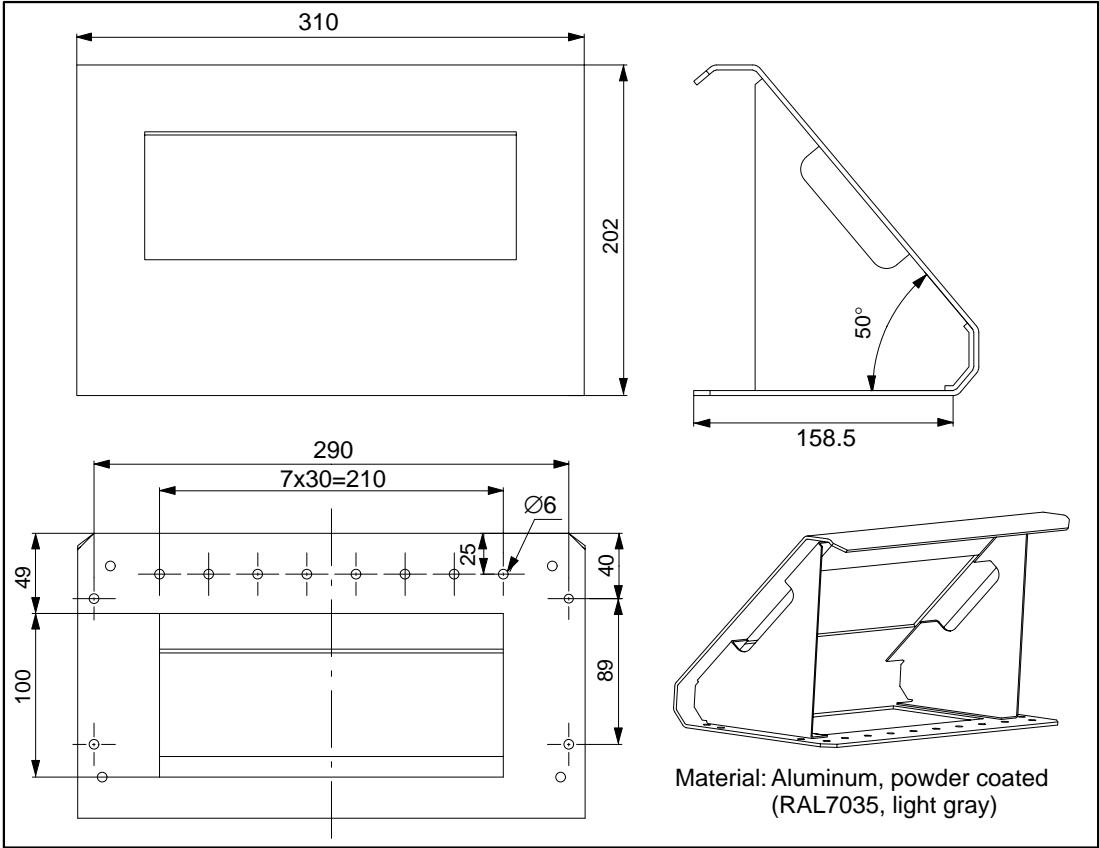


Fig. 22.3: Dimensions for the desktop housing, Order No.: 1-TG2116

Modifications reserved.

All details describe our products in general form only. They are not to be understood as express warranty and do not constitute any liability whatsoever.

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