

Manual | Load Cell Amplifier DAD 141.1



0. Table of Contents:

0.	Table of Contents:	2
1.	Safety Instructions	5
2.	Declaration of Conformity	6
3.	Introduction and Specifications	7
4.	Communications and Getting started	8
4.1.	Serial Interface	8
4.2.	Command Language	8
4.3.	Baud Rate	8
4.4.	Getting Started Via RS422/485	8
4.5.	Getting Started Via Ethernet Interface	9
4.6.	Modbus TCP or Modbus RTU	9
5.	Hardware and Wiring	10
5.1.	Housing & Terminals	10
5.2.	Terminals Load Cell Connection	10
5.3.	Load Cell Connection	10
5.4.	Terminals Power Supply	11
5.5.	Terminals Serial Port RS 422/485	11
5.6.	Ethernet Port	11
5.7.	Seal Switch	11
5.8.	Logic Inputs & Outputs	12
5.9.	Analog Outputs	12
6.	Menu Structure Setup Keyboard	13
7.	Setup Via Front Panel Keyboard	14
7.1.	Keyboard Buttons	14
7.2.	Use of Keyboard Buttons	14
7.3.	Menu 1 – System Zero	15
7.4.	Menu 2 – System Span	16
7.5.	Menu 3 – Display	16
7.6.	Menu 4 – Filter & Motion Detection	17
7.7.	Menu 5 – Analog Output	18
7.8.	Menu 6 – Logic Inputs	19
7.9.	Menu 7 – Logic Outputs	20
7.10.	Menu 8 – Data Communication	21
7.11.	Factory Default via Front Panel	22
7.12.	Error Codes	23
8.	Examples	24
8.1.	Example 1 – Calibration procedure using weights	24
8.2.	Example 2 – Calibration procedure using load cell's mV/V sensitivity	26

9. Commands – Overview	28
10. Commands Description	30
10.1. System Diagnosis Commands – ID, IH, IV, IS, SR, RS	30
10.1.1. ID Get Device Identity [Index 0x202C]	30
10.1.2. IH Get Hardware Version	30
10.1.3. IV Get Firmware Version [Index 0x202E]	30
10.1.4. IS Get Device Status [Index 0x2030]	30
10.1.5. SR Reset DAD 141.1 Firmware	31
10.1.6. RS Read Serial Number [Index 0x2034]	31
10.2. Calibration Commands – CE, CM, CI, DS, DP, CZ, CG, ZT, FD, ZR, ZI, AZ, AG, CS, SU, RU	31
10.2.1. CE Read TAC* Counter / Open Calibration Sequence [Index 0x2204]	31
10.2.2. CM Set Maximum Output Value [Index 0x220C]	31
10.2.3. CI Set Minimum Output Value [Index 0x220E]	31
10.2.4. DS Set Display Step Size [Index 0x2216]	32
10.2.5. DP Set Decimal Point Position [Index 0x2214]	32
10.2.6. CZ Set Calibration Zero Point [Index 0x2212]	32
10.2.7. CG Set Calibration Gain (Span) [Index 0x2206]	32
10.2.8. ZT Zero Tracking [Index 0x2122]	33
10.2.9. FD Reset to Factory Default Settings [Index 0x2066]	33
10.2.10. ZR Zero Range [Index 0x2220]	33
10.2.11. ZI Initial Zero ON / OFF [Index 0x221E]	33
10.2.12. AZ Absolute zero point calibration (eCal) [Index 0x2202]	34
10.2.13. AG Absolute gain calibration (eCal) [Index 0x2200]	34
10.2.14. CS Save the Calibration Data [Index 0x2066]	34
10.2.15. SU Save User Setup in EEPROM	34
10.2.16. RU Restore User Setup to DAD 141.1	34
10.3. Motion Detection Commands – NR, NT	35
10.3.1. NR Set 'No-motion' Range [Index 0x2112]	35
10.3.2. NT Set 'No-motion' Time Period [Index 0x2114]	35
10.4. Filter Setting Commands – FM, FL, UR	36
10.4.1. FM Filter Mode [Index 0x2110]	36
10.4.2. FL Filter Settings [Index 0x2106]	36
10.4.3. UR Update Rate and Averaging [Index 0x2120]	37
10.5. Taring and Zeroing Commands – SZ, RZ, ZN, ST, RT, TN, RW, TI	38
10.5.1. SZ Set System Zero [Index 0x2061]	38
10.5.2. RZ Reset Zero [Index 0x2061]	38
10.5.3. ZN Store Zero Value [Index 0x2226]	38
10.5.4. ST Set Tare [Index 0x2061]	38
10.5.5. RT Reset Tare [Index 0x2061]	38
10.5.6. TN Store Tare Value [Index 0x2224]	39
10.5.7. TW Window for Automatic Taring [Index 0x240A]	39
10.5.8. TI Averaging Time for Automatic Taring [Index 0x240C]	39
10.6. Output Commands – GG, GN, ON, GT, GS, GW, GA, GH, GM, RM, GO, GV	40
10.6.1. GG Get Gross Value [Index 0x2000 or 0x2020]	40
10.6.2. GN Get Net Value [Index 0x2002 or 0x2022]	40
10.6.3. ON Get Net Value of device 'n'	40
10.6.4. GT Get Tare Value [Index 0x2118]	40
10.6.5. GS Get ADC Sample Value [Index 0x202A]	40
10.6.6. GW Get Data String "Net, Gross and Status" [Index 0x3300 or 0x3500]	40
10.6.7. GA Get Triggered Average Value [Index 0x2008 or 0x2028]	41
10.6.8. GH Get Hold Value [Index 0x2084 or 0x2086]	41
10.6.9. TH Trigger Hold Value [Index 0x2061]	41
10.6.10. GM Get Peak Value [Index 0x2080 or 0x2082]	41
10.6.11. RM Reset Peak Value [Index 0x2061]	41
10.6.12. GO Get Peak To Peak Value [Index 0x208C or 0x208E]	41
10.6.13. GV Get Valley Value [Index 0x2088 or 0x208A]	41

10.7.	Auto-Transmit Commands – SG, SN, SW, SA, SH, SM, SO, SV	42
10.7.1.	SG Send Gross Value continuously	42
10.7.2.	SN Send Net Value continuously	42
10.7.3.	SW Send Data String “Net, Gross and Status“ continuously	42
10.7.4.	SA Send Triggered Average Value automatically	42
10.7.5.	SH Send Hold Value continuously	42
10.7.6.	SM Send Peak Value continuously	42
10.7.7.	SO Send Peak To Peak Value continuously	42
10.7.8.	SV Send Valley Value continuously	42
10.8.	Logic Input Functions & Status – AI’n’, IN	43
10.8.1.	AI Assign input ‘n’ [Index 0x2074 and 0x2076]	43
10.8.2.	IN Read status of the logic inputs [Index 0x210C]	43
10.9.	Logic Output Commands - IO, OM, S’n’, H’n’, P’n’, A’n’, HT	44
10.9.1.	IO Read / Modify the Status of the logic Outputs [Index 0x210A]	44
10.9.2.	OM Control of the logic outputs by the host application [Index 0x2116]	44
10.9.3.	A’n’ Assign action for setpoint ‘n’ [Index 0x2068]	45
10.9.4.	S’n’ Setpoint Value [Index 0x206C]	45
10.9.5.	H’n’ Setpoint Hysteresis and Switching Action [Index 0x206A]	45
10.9.6.	P’n’ Polarity of Setpoint [Index 0x2070]	46
10.9.7.	HT Hold time for all Setpoints [Index 0x2408]	46
10.10.	Communication Setup Commands – AD, NA, BR, DX, OP, CL, TD	47
10.10.1.	AD Device Address	47
10.10.2.	NA Network Address [Index 0x300C]	47
10.10.3.	BR Baud Rate	47
10.10.4.	DX Operation Mode Half-/Full-Duplex	47
10.10.5.	OP Open Device	47
10.10.6.	CL Close Devices	47
10.10.7.	TD Transmission Delay	47
10.11.	Analog Output – AA, AH, AL, AM	48
10.11.1.	AA Analog Output Base [Index 0x2100]	48
10.11.2.	AH Set Analog High Level [Index 0x2102]	48
10.11.3.	AL Set Analog Low Level [Index 0x2104]	48
10.11.4.	AM Set Analog Output Mode [Index 0x2128]	48
10.12.	Save Calibration and Setup – CS, WP, SS, AS, GI, PI	49
10.12.1.	CS Save the Calibration Data [Index 0x2066]	49
10.12.2.	WP Save the Setup Parameters [Index 0x2066]	49
10.12.3.	SS Save Setpoint Parameters [Index 0x2066]	49
10.12.4.	AS Save Analogue Output Parameters [Index 0x2066]	49
10.12.5.	GI Get an Image File from the EEPROM	49
10.12.6.	PI Download an Image File to the EEPROM	49
10.13.	Trigger Commands – SD, MT, GA, TE, TR, TL, SA	50
10.13.1.	SD Start Delay Time [Index 0x211A or 0x2412]	50
10.13.2.	MT Measuring Time [Index 0x210E or 0x2410]	50
10.13.3.	GA Get Triggered Average Value [Index 0x2008 or 0x2028]	50
10.13.4.	TE Trigger Edge [Index 0x2402 or 0x211C]	50
10.13.5.	TR Software Trigger [Index 0x2062]	50
10.13.6.	TL Trigger Level [Index 0x211E or 0x2400]	51
10.13.7.	SA Send Triggered Average Value automatically	51
11.	Use in “Approved” Applications	52
12.	Calibration and Calibration Sequence	53

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1. Safety Instructions



CAUTION READ this manual BEFORE operating or servicing this equipment. FOLLOW these instructions carefully. SAVE this manual for future reference. DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment. ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance. CALL Hauch & Bach ApS for parts, information, and service.



WARNING ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.



WARNING FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.



WARNING DISCONNECT ALL POWER TO THIS UNIT BEFORE REMOVING THE FUSE OR SERVICING.



WARNING BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT OR BODILY HARM.



CAUTION OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

2. Declaration of Conformity

EG-Konformitätserklärung EC-Declaration of Conformity

Monat/Jahr: *month/year*: 06/2013
Hersteller: *Manufacturer*: Hauch & Bach ApS
Anschrift: *Address*: Femstykke 6
DK-3540 Lyngø
Dänemark / Denmark
Produktbezeichnung: *Product name*: DAD 141.1

Das bezeichnete Produkt stimmt mit folgenden Vorschriften der Europäischen Richtlinien überein:
This product confirms with the following regulations of the Directives of the European Community

Richtlinie 2004/108/EG des Europäischen Parlaments und des Rates vom 15. Dezember 2004 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit und zur Aufhebung der Richtlinie 89/336/EWG

Directive 2004/108/EC of the European Parliament and of the Council of 15th December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften.

This declaration certifies the conformity with the listed directives, but it is no promise of characteristics.

Richtlinie 2006/95/EG Niederspannungs-Richtlinie **Directive 2006/95/EC** Low Voltage Directive

Folgende Normen werden zum Nachweis der Übereinstimmung mit den Richtlinien eingehalten:
As a proof of conformity with the directives following standards are fulfilled:

OIML R-76-1	Nicht-Selbsttätig Waagen – Metrologische und technische Anforderungen (OIML R-76:2002 Teil 1) <i>Non-automatic weighing systems – Metrological and technical requirements (OIML R-76:2002 Part 1)</i>
DIN EN 45501	Metrologische Aspekte nichtselbsttätiger Waagen; Deutsche Fassung EN 45501:1992 <i>Anhang B.3: Funktionsprüfungen unter Störeinflüssen</i> <i>Anhang C: Verfahren für die Prüfung der Störfestigkeit gegen hochfrequente elektromagnetische Felder.</i>



Michael Bach
Managing Director

3. Introduction and Specifications

The **all-in-one** Digital Amplifier DAD 141.1 is a universal device for any weighing, filling or loss-in-weight operation and for force measurements with strain gage sensors. The DAD141 is for DIN (TS35) rail mount.

To grant the quality and allow legal weighing the DAD141.1 is OIML R-76 approved (pending) and meet the MID E2 requirements to EMC.

The standard device includes all the communication facilities needed for industrial weighing, control and registration, i.e. analog current or voltage output (0/4...20 mA, 0...5V, 0...10V, -5V...+5V and -10V...+10V), Ethernet, RS 422/485 and logic I/O's for direct control of valves or bars etc.

The device can be controlled either by the front keys, via RS 422/485 port or Ethernet port. 2 logic inputs and 3 logic outputs make complex control functions easy. The 3 logic outputs can be controlled external, too.

The device features fullfills multi-drop communications capability and can be programmed via a straightforward ASCII command set. It is theoretically possible to connect 256 nodes on a network using the type of RS485 transceivers the DAD 141.1 use. The addressing allow 255 units (1 to 255).

DAD 141.1 Specifications	
Accuracy class	III
Test certificate according OIML R76	EU Type approved for 10000 intervals
AD converter	Delta-Sigma, ± 24 bit
Analog input range	± 15 mV bipolar (± 3 mV/V @ 5 VDC excitation)
Minimum input sensitivity	0.2 μ V/e (legal for trade); 0.05 μ V/d (non legal for trade)
Linearity	< 0.001 % FS
Temperature effect on zero	< ± 4 ppm/ $^{\circ}$ K (typical < ± 2 ppm/ $^{\circ}$ K)
Temperature effect on span	< ± 8 ppm/ $^{\circ}$ K (typical < ± 4 ppm/ $^{\circ}$ K)
Excitation	5 V DC, load cell(s) resistance 50 - 2000 ohms; 6 wire technic
Conversion rate	Max. 600 values/second, selectable in 8 steps
Resolution external	$\pm 600\,000$ counts @ ± 3 mV/V input signal
CALIBRATION & WEIGHING FUNCTIONS	
Calibration	Electronical calibration in mV/V (eCal) or with test weight(s)
Digital low pass filter	FIR Filter 2.5 to 19.7 Hz or IIR Filter 0.25 to 18 Hz - adjustable in 8 steps
Weighing functions	Zero, gros, tare, net, filter, etc.
Application modes	None automatic weighing instrument (NAWI) or triggered measurement
Communication & Setup	
Communication ports	RS 422/485 and Ethernet
Setup & Calibration	Panel buttons or Windows software 'DOP 4'
Display	6 digit 7 segments, green LED's, 5.08mm, 8 status LED green, spectral filter 565 nm for improved contrast
Keyboard	4 pcs, \varnothing 3mm robust, for setup / calibration, zero, tare
Power supply	12 ... 24 V DC ± 10 %, < 4 W
Environmental Conditions	
Operating temperature	-15 $^{\circ}$ C to +55 $^{\circ}$ C at maximal 85% rh, non condensing
Storage temperature	-30 $^{\circ}$ C to +70 $^{\circ}$ C
Enclosure & protection	Plastic housing, for DIN rail mount (TS35) , protection IP40
Dimensions and weight	120 x 105 x 22.5 mm (H x L x W), weight approx. 170 g
EMC performance	EN61326 according to MID E2 for industrial applications (in full accordance with 2004/22/EC)
Vibration resistance	2.5g @ operation, 5g @ storage
Serial Interface	
RS 422/485, 9600 ... 115200 Baud – half/full duplex	
Protocol & Address range	ASCII; address range 1 ... 31
Modbus RTU	Binary data
Ethernet interface	
RJ45, 10/100 Mbit/s, isolated	
Ethernet TCP/IP – protocol & port	protocol ASCII, TCP port 23
Modbus TCP – protocol & port	Embedded in TCP/IP packages, protocol binary data, TCP port 502
IP address	Setup via serial port or panel buttons – Factory default: 192.168.0.100
Analog current output	0 – 20mA or 4 – 20mA, 500ohm, isolated or
Analog voltage output	0 – 10V, 0 – 5V, ± 5 V, ± 10 V, 10kohm, isolated
Digital logic inputs	2 inputs (10 – 30V, 1 – 3mA), common ground, isolated
Digital logic outputs	3 outputs (semiconductor relais) 30 V DC/AC, 0.5 A, common ground, isolated

4. Communications and Getting started

4.1. Serial Interface

Communicating with the digital amplifier DAD 141.1 is carried out via serial RS 422/485 port. The data format is the familiar 8/N/1 structure (8 data bits, no parity, 1 stop bit). Available baud rates of RS 422/485 port are as follows: 9600, 19200, 38400, 57600 or 115200 baud.

Factory default: 115200 baud

4.2. Command Language

The command set of the DAD 141.1 is based on a simple ASCII format (2 letters). This enables the user to setup the device, get results or check parameters.

Example: DAD 141.1 is connected via the RS 485 port to a PC / PLC system. You want to get the identity, firmware version or net weight.

Remark: In this manual means: “_” Space in the setup command and “↵” Enter (CR); sending of a linefeed (LF) is not required and will be ignored by the device if necessary.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
ID↵	D:1410	identity of the active device
IV↵	V:0101	Firmware version of the active device
GN↵	N+123.45	Net weight with algebraic sign; decimal point is fixed as setup with command DP

4.3. Baud Rate

For baud rate setup use command BR, see chapter 10.10.3.

Factory default: 115200 baud

4.4. Getting Started Via RS422/485

You will require:

- PC or PLC with a RS 422/485 communication port
- A load cell / scale with test weights or a load cell simulator
- A 12-24 VDC power supply capable of delivering approximately 200mA for each DAD 141.1 and load cell(s)
- One or more DAD 141.1
- A suitable ASCII communication software **

Refer to the wiring diagrams in chapter 5.

**

You can easily communicate between a PC and a DAD 141.1 using programs such as Procomm, Telemate, Kermit, HyperTerminal or HTerm etc.

Additional the powerful software **DOP 4** with graphical user interface and oscilloscope function for the operating systems Windows XP/Vista/7/8 is available.

Hint:

A download of a new firmware version can be done with the software **H&B programmer 3.0** (or later). The download can be done via RS485 at a baud rate of 115200 or via Ethernet interface.

4.5. Getting Started Via Ethernet Interface

You will require:

- PC or PLC with an Ethernet port
- A load cell / scale with test weights or a load cell simulator
- A 12-24 VDC power supply capable of delivering approximately 200mA for each DAD 141.1 and load cell(s)
- One or more DAD 141.1 in the Ethernet LAN
- Ethernet TCP/IP, protocol ASCII, TCP port 23
- Modbus TCP, embedded in TCP/IP packages, protocol binary data, TCP port 502

The factory default TCP/IP address of DAD 141.1 is **192.168.0.100**. You can change the address in the menu 8.6 (chapter 7.10) via front panel or via the command NA (network address).

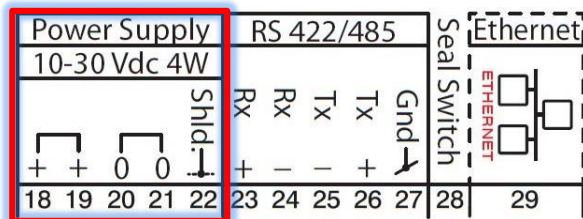
4.6. Modbus TCP or Modbus RTU

The DAD 141.1 supports both, Modbus RTU (via RS422/485 port) and Modbus TCP (via Ethernet port).

- Modbus TCP, embedded in TCP/IP packages, protocol binary data, TCP port 502
- Modbus RTU (binary data).

For Modbus communication please use the separate manual. In this manual you find only for each command the corresponding Modbus Index. In case of no index, the command is not available for Modbus use.

5.4. Terminals Power Supply



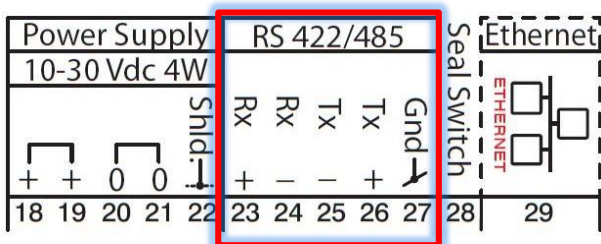
DAD 1411	Power in	Function
Pin no.		
18	+	Power supply +12..24 V DC
19	+	Power supply +12..24 V DC
20	-	Common ground / 0 V DC
21	-	Common ground / 0 V DC
22	Shld.	Chassis ground

Depending on the grounding concept of the plant/scale, terminal 20 or 21 has to be connected to terminal 22.

The power supply must be able to support about 200mA per DAD 141.1.

5.5. Terminals Serial Port RS 422/485

The RS 422/485 port can be used for communication with a PC or PLC system.

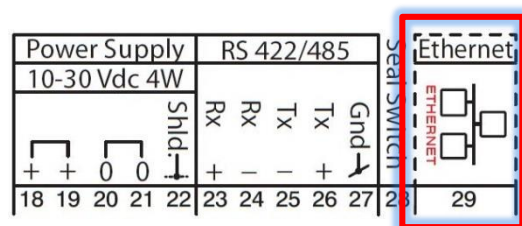


DAD 141.1	RS 422/485	Function
Pin no.		
23	+ Rx	+ Receive Data
24	- Rx	- Receive Data
25	- Tx	- Transmit Data
26	+ Tx	+ Transmit Data
27	GND	Signal ground RS422/485

The serial port supports two protocols:

- ASCII (characters) and
- Modbus RTU (binary data).

5.6. Ethernet Port



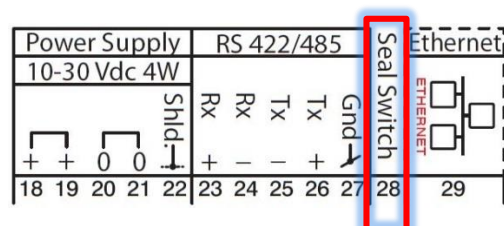
The Ethernet port (29, RJ45) can be used for communication in a local area network (LAN) with 10/100 Mbit/s

The Ethernet port supports:

- Ethernet TCP/IP, protocol ASCII, TCP port 23
- Modbus TCP, embedded in TCP/IP packages, protocol binary data, TCP port 502.

The default IP address is **192.168.0.100**, which can be changed by the user.

5.7. Seal Switch



Setup or changes of calibration can only be performed with an open seal switch (28). Changes lead to get a new TAC value of + 1.

Running a legal for trade application needs the jumper connected to the switch pins and a seal. A broken seal shows up changes of calibration, which are not allowed.

➔ Protected commands see next page.

Traceable Access Code (TAC) protected calibration commands

In case the seal switch is closed, the following commands or menus can't be proceeded:

- Calibration Zero
- Calibration Gain
- Calibration Absolute Zero
- Calibration Absolute Gain
- Calibration Minimum
- Calibration Maximum
- Zero Tracking
- Zero Range
- Display Step Size
- Decimal Point
- Calibration Save
- Factory Default
- Non Volatile Tare
- Non Volatile Zero
- Initial Zero @ power ON

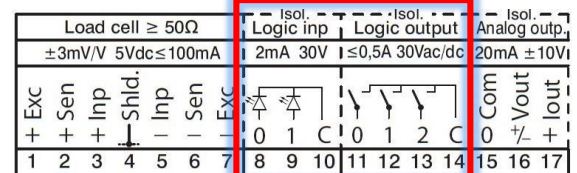
5.8. Logic Inputs & Outputs

The DAD 141.1 offers 2 isolated logic inputs and 3 isolated logic outputs.

The 2 inputs can e.g. get the function act as the ZERO or TARE button, see chapter 10.8.1.

The 3 outputs act as switches for setpoints with hysteresis, switch behavior etc. Several bases can be used like net weight, peak weight value or average value, see chapter 10.9.x.

DAD 141.1	Logic In- / Output	Function
Pin no.		
8	0	'High' Logic input 0
9	1	High' Logic input 1
10	C	Common 'low' logic input 0/1
11	0	'High' Logic output 0
12	1	'High' Logic output 1
13	2	High' Logic output 2
14	C	Common 'low' logic output 0/1/2

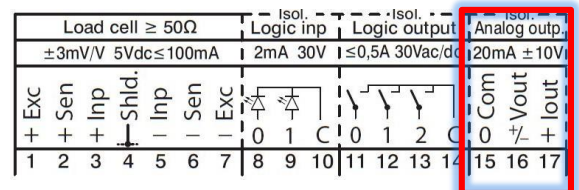


5.9. Analog Outputs

The DAD 141.1 offers 2 isolated analog outputs for current and voltage. For your application you can choose one of the six modes like:

- 4 to 20mA / 0 to 20mA
- 0 to +5V / 0 to +10V
- -5 to +5V / -10 to +10V.

DAD 141.1	Analog Outputs	Function
Pin no.		
15	0 Com	Signal ground analog output
16	+/- Vout	Voltage output
17	Iout	Current output



6. Menu Structure Setup Keyboard

To Enter the DAD 141.1 setup menu, press the 'UP' or 'DOWN' arrow button for 3 seconds. To enable calibration, remove the jumper from **seal switch** (pins 28)

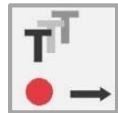
1.x Zero	2.x Span	3.x Display	4.x Filter & Motion	5.x Analog out	6.x Input 0/1	7.x Output 0/1/2	8.x Data communicat.
1. Switch ON or OFF Zero Tracking	1. Increments 'n' at which the span calibration is performed.	1. Number of increments 'n' at which the display shows overload or underload.	1. Cut-off frequency of the low-pass filter, see below.	1. Set number of increments 'n' corresponding to minimum output level, e.g. 4mA	x.1. Assign an logical input to a specific function, e.g. the Tare button.	x.1.1 Set number of increments 'n' corresponding to the setpoint.	1. Select the baud rate
2. Set system Zero as based on the actual input (weight)	Reference 2.2 or 2.3		Mode IIR FIR	2. Set number of increments 'n' corresponding to maximum output level, e.g. 20mA			2. Select RS422 for point2point communication or RS485 for networks
3. Set System Zero electronically	2. Calibration of Span as based on the actual input (weight)	2. Display step size (1, 2, 5, 10, 20 etc.) per division 'd'.	1.1 18Hz 19.7Hz 1.2 8Hz 9.8Hz 1.3 4Hz 6.5Hz 1.4 3Hz 4.9Hz 1.5 2Hz 3.9Hz 1.6 1Hz 3.2Hz 1.7 0.5Hz 2.8Hz 1.8 0.25Hz 2.5Hz	3. Select the base for the analog output, e.g. gross weight.		x.1.2 Switch characteristic for Setpoint 'on' or 'off'	3. Select device address for RS485 networks (0 for point2point)
4.1 Enable / disable actual Tare value non-volatile.	3. Calibration of Span electronically	3. Set decimal point position.		4. Select the analog output mode, e.g. 4-20mA or 0 – 10V		x.2. Setup Hysteresis in increments for the setpoint	4. Autotransmit data at power ON
4.2 Enable / disable actual Zero value non-volatile.	4. Display shows the actual load cell input signal in mV/V		2. Select Filter Mode IIR or FIR	5. Test the selected current or voltage output		x.3. Select the base for the setpoint, e.g. gross weight	5. Set delay in milliseconds before any transmission starts
4.3 Enable / disable initial zero @ power ON.	5. Display of the Firmware Version		3. Number of updates per second from averaging filter	Range of test signals: '4_20': 3.9 to 20.1 mA '0_20': -0.1 to 20.1 mA '0_5': -0.1 to +5.1 V '0_10': -0.1 to +10.1 V '5_5': -5.1 to +5.1 V '10_10': -10.1 to +10.1 V		x.4. Test mode LOs: Open / Close contacts by using UP/DOWN buttons.	6 x Set the IP-Address used by the Ethernet interface in decimal notation, e.g. 192.168.0.100
4.4 Set Zero Range and Zeroing	6. Display of the TAC counter value		4.1 Set No-Motion range in increments			3. Set Hold Time for all Setpoints.	7. Modbus parity check no - odd - even
			4.2 Set No-Motion time in milliseconds			This is the time period before a switch event will be initiated.	8. Protocol serial port SER = ASCII
							RTU = binary data
							9. User Setup
							STORE: save in EEPROM
							RECALL: restore f. EEPROM

7. Setup Via Front Panel Keyboard

7.1. Keyboard Buttons



This is the ZERO button. This button can be used for zeroing in the scale status NO Motion within the setup limits and to clear TARE.



This is the TARE button. This button can be used for taring the scale in status NO Motion.



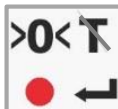
The two UP/DOWN buttons will be used for setup via the menu.

7.2. Use of Keyboard Buttons

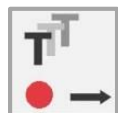


Press the UP or DOWN button for more than 3 seconds to enter the setup menu of front panel. In setup menu use these buttons to select one of the menus 1 to 8 and make your selection in the sub-menus or to setup single characters of the display.

Remark: To enable calibration – menu 1, 2 and 3 – you have to remove the jumper of seal switch (28). The TAC counter will increase by one after changes.



Enter in menu X to the different sub-menus of X. After choosing the setting with the UP or DOWN button, use this key again for storing. This is the ENTER button.



To leave menu X or sub-menu of X.
Leave with: press 1x TARE button for back to menu X.1 – 1st level
or press 2x TARE button for back to menu X

					Menu 7.0.1.1 – Setup Value 001000
X			Menu X	Select with UP / DOWN buttons Enter with ZERO button Leave with TARE button	<div> </div>
	X.1		Menu X - 1st level	Enter with ZERO button Select with UP / DOWN buttons Back with ZERO button Leave with TARE button	<div> </div>
		X.1.1	Menu X - 2nd level	Enter with ZERO button Select with UP / DOWN buttons Enter with ZERO button Leave with TARE button	
			X.1.1.1 Menu X - 3rd level	<div> </div> Enter with ZERO button Select with UP / DOWN buttons Enter with ZERO button Use UP / DOWN buttons for single characters Use TARE button for next number Back with ZERO button Leave with: 1x TARE button back to menu X.1 2x TARE button back to menu X	<div> </div>

7.3. Menu 1 – System Zero

Remark: Activate a new calibration with 1x Power OFF & ON !

1.		ZERO setup (Menu 1.1 to 1.4)	TAC protected – see chapter 4.12
	1.1	Automatic Zero Tracking - Enable / Disable	(command ZT)
		Setting range: 0 ... 255 d	
		- Disabled @ 00000, no ZERO Tracking	
		Enabled @ 00001 or higher (max 00255)	
		- Setting 00001 sets a zero tracking range of $\pm 0.5d$	
		- Setting 00002 up to 00255 sets a zero track range of $\pm 1d$ up to $\pm 127.5d$, independent of decimal point setting	
	1.2	Calibrate system ZERO - gravimetric by weight / load	(command CZ)
		- Display shows the actual input signal in mV/V. Press ENTER button to store ZERO.	
		Remark: Scale should/must be unloaded.	
	1.3	Calibrate system ZERO - electronic by mV/V value	(command AZ)
		- Use the UP/DOWN & MOVE RIGHT keys to setup the mV/V value at which the device should read ZERO	
	1.4	System ZERO & TARE function	
	1.4.1	Store TARE value non volatile: ON / OFF	(command TN)
		- ON: store non-volatile @ power OFF	
		- OFF: delete @ power OFF	
	1.4.2	Store ZERO value non volatile: ON / OFF	(command ZN)
		- ON: store non-volatile @ power OFF	
		- OFF: delete @ power OFF	
	1.4.3	Initial ZERO @ power ON: ON / OFF	(command ZI)
		- ON: proceed initial Zero @ power ON	
		- Range is $\pm 10\%$ of Max	
	1.4.4	ZERO range (increments)	(command ZR)
		- Set the zero setting range in divisions. The setting is independent of decimal point setting.	
		- Disabled @ 00000, no ZEROing possible	
		- Enabled @ 00001 or higher (max 999999)	
		In a legal for trade application, the standard value is $\pm 2\%$ of Max. The setup for a scale with 3 000e is i.e.:	
		- Max (CM) = 1 500 kg	
		- Step Size (SZ) = 0.5 kg	
		- Zero Range (ZR) of $\pm 2\%$ = ± 30 kg, which is ± 60 d.	

7.4. Menu 2 – System Span

Remark: Activate a new calibration with 1x Power OFF & ON !

2.		SPAN setup (Menu 2.1 to 2.4) TAC protected – see chapter 4.12
2.1		Set SPAN Calibration value (command CG) <ul style="list-style-type: none"> - Set display value equivalent to calibration weight or to mV/V value derived from load cell(s) test data.
2.2		Calibrate system SPAN - gravimetric by weight / load <ul style="list-style-type: none"> - Display shows the actual input signal in mV/V. - Apply test weight equivalent to calibration value (2.1). - Press ENTER button to store new SPAN signal.
2.3		Calibrate system SPAN - electronic by mV/V input (command AG) <ul style="list-style-type: none"> - Use the UP/DOWN & MOVE RIGHT keys to setup the mV/V value at which the device should read SPAN. - Press ENTER button to store new SPAN signal.
2.4		Display the input signal in mV/V <ul style="list-style-type: none"> - This function displays the actual input signal of the load cell(s).
2.5		Display the firmware version, e.g. 1.10 (command IV) <ul style="list-style-type: none"> - Read and display the firmware version.
2.6		Display the actual TAC value, e.g. 34 (command CE) <ul style="list-style-type: none"> - Read and display the TAC value of the actual calibration.

7.5. Menu 3 – Display

Remark: Activate a new calibration with 1x Power OFF & ON !

3.		Display setup (Menu 3.1 to 3.3) TAC protected – see chapter 4.12
3.1		Display limits - Overrange / Underrange (commands CM/CI)
	3.1.o	Display overrange limit (maximum value +999999) Use the UP/DOWN & MOVE RIGHT keys to setup the maximum display value, above which the display shows over range (all dashes in the top of the display).
	3.1.U	Display underrange limit (minimum value -999999) Use the UP/DOWN & MOVE RIGHT keys to setup the minimum display value, above which the display shows under range (all dashes in the bottom of the display).
3.2		Display step size - in digits [d] (command DS) <ul style="list-style-type: none"> - choose one out of 1, 2, 5, 10, 20, 50, 100, 200, 500
3.3		Decimal point position on the display (command DP) <ul style="list-style-type: none"> - choose one out of 0, 0.0, 0.00, 0.000, 0.0000, 0.00000

7.6. Menu 4 – Filter & Motion Detection

Remark: Activate a new setup with 1x Power OFF & ON !

4		Digital filter & No Motion setup (Menu 4.1 to 4.4)	
	4.1	Low pass filter cut off frequency (command FL)	
		- Settings: 0 - 8 with UP/DOWN buttons	
	4.1.x	Cut off frequency:	
		IIR mode	FIR mode
	4.1.0	No digital filter	No digital filter
	4.1.1	18 Hz	19.7 Hz
	4.1.2	8 Hz	9.8 Hz
	4.1.3	4 Hz	6.5 Hz
	4.1.4	3 Hz	4.9 Hz
	4.1.5	2 Hz	3.9 Hz
	4.1.6	1 Hz	3.2 Hz
	4.1.7	0.5 Hz	2.8 Hz
	4.1.8	0.25 Hz	2.5 Hz
	4.2	Digital filter Mode - IIR or FIR (command FM)	
		- Choose IIR or FIR	
	4.3	Update rate and averaging (command UR)	
	4.3.x	Averaging (from 1 to 128 readings)	
	4.3.0	0 - each reading	
	4.3.1	1 - average of 2 readings	
	4.3.2	2 - average of 4 readings	
	4.3.3	3 - average of 8 readings	
	4.3.4	4 - average of 16 readings	
	4.3.5	5 - average of 32 readings	
	4.3.6	6 - average of 64 readings	
	4.3.7	7 - average of 128 readings	
	4.4	Motion detection	
	4.4.1	No motion range (value range from 1 to 65 535 d) (command NR)	
		Weight value changes within this range will be considered as 'stable'	
	4.4.2	No motion time (value range from 1 to 65 535 ms) (command NT)	
		Time span for the no motion detection where the signal has to be 'stable'	

7.7. Menu 5 – Analog Output

Remark: Activate a new setup with 1x Power OFF & ON !

5	Analog output setup (Menu 5.1 to 5.5)	
5.1	Weight value for minimum analog output (command AL) - Set the weight value which corresponds to minimum output Examples for scale 0 ... 3 000kg Minimum 0kg or with 600kg preload - output mode 4 ... 20mA: 0kg = 4mA - setting 00000 	

7.8. Menu 6 – Logic Inputs

Remark: Activate a new setup with 1x Power OFF & ON !

6		Logic input setup (Menu 6.0 to 6.1)
6.0		Logic Input "0" (command AI'n' – n=0)
6.0.1		Functions (choose one from 00 to 15 with 'up'/'down' buttons)
		00 - Input "0" has no function 01 - Input "0" acts as Zero button 02 - Input "0" acts as Tare button 03 - Input "0" acts as Up arrow button 04 - Input "0" acts as Down arrow button 05 - Input "0" starts the Trigger function 06 - Input "0" displays the Average value 07 - Input "0" displays the Peak value (maximum) 08 - Input "0" deletes the Peak value (maximum) 09 - Input "0" displays the Hold value 10 - Input "0" displays the Peak to Peak value 11 - Input "0" displays the Valley value (minimum) 12 - Input "0" disables the buttons 13 - Input "0" stores the actual weight (Hold value) 14 - Input "0" tares the displays and deletes all other values 15 - Input "0" turn off display
6.1		Logic Input "1" (command AI'n' – n=1)
6.1.1		Functions (choose one from 00 to 15 with 'up'/'down' buttons)
		00 - Input "1" has no function 01 - Input "1" acts as Zero button 02 - Input "1" acts as Tare button 03 - Input "1" acts as Up arrow button 04 - Input "1" acts as Down arrow button 05 - Input "1" starts the Trigger function 06 - Input "1" displays the Average value 07 - Input "1" displays the Peak value (maximum) 08 - Input "1" deletes the Peak value (maximum) 09 - Input "1" displays the Hold value 10 - Input "1" displays the Peak to Peak value 11 - Input "1" displays the Valley value (minimum) 12 - Input "1" disables the buttons 13 - Input "1" stores the actual weight (Hold value) 14 - Input "1" tares the displays and deletes all other values 15 - Input "1" turn off display

7.9. Menu 7 – Logic Outputs

Remark: Activate a new setup with 1x Power OFF & ON !

7		Logic output setup (Menu 7.0 to 7.2)	
	7.0	Logic Output "0"	
	7.0.1	Setpoint "0"	
		7.0.1.1 Setup of the Setpoint value (command S'n' – n=0)	
		Permitted values +/- 999 999	
		7.0.1.2 Setup the Polarity (switch logic) ON or OFF (command P'n' – n=0)	
		Use the UP/DOWN buttons for "on" / "oFF"	
	7.0.2	Hysterisis value "0" (\pm 'n') (command H'n' – n=0)	
		Permitted values +/- 9 999	
	7.0.3	Base for Setpoint "0" (command A'n' – n=0)	
		gros - G ross value net - N et value PEA - P eak value (Maximum) AUer - A verage value HoLd - H old value PP - P eak to P eak value UALL - V alley value (Minimum) Error - E rror 4 or 5 oFF - set output "1" OFF	
	7.0.4	Test logic output "0" (Use the UP/DOWN buttons)	
		Open/Close contacts using the keyboard	
		7.0.4.0 Output is OFF	
		7.0.4.1 Output is ON	
	7.1	Logic Output "1" (commands S'n', P'n', H'n', A'n' – n=1)	
		As per section 7.0 - but for logic output "1"	
	7.2	Logic Output "2" (commands S'n', P'n', H'n', A'n' – n=2)	
		As per section 7.0 - but for logic output "1"	
	7.3	Hold Time for <u>all</u> the Logic Outputs 0, 1 and 2 (command HT)	
		Permitted value range is from 0 to 65 535 ms	
		The signal has to exceed the setpoint limit continuously at least for this time period before a switch event will be initiated.	

7.10. Menu 8 – Data Communication

Remark: Activate a new setup with 1x Power OFF & ON !

8	Data Communication setup (Menu 8.1 to 8.9)
8.1	Baud Rate for COM Port RS 422/485 (use the UP/DOWN buttons) (command BR)
	9600 Baud 19200 Baud 38400 Baud 57600 Baud 115200 Baud
8.2	Select RS 422 or RS 485 (use the UP/DOWN buttons)
	422 = RS 422 Interface for single DAD 141.1 application 485 = RS 485 Interface for multiple DAD 141.1 application in a bus
8.3	Set Device Address COM Port (RS 422/485) (command AD)
	<ul style="list-style-type: none"> - Set device address for multi-drop to 001 ... 255 - Set device address for single point to point applications to 000 - Factory Default: 000
8.4	Select Auto-transmit mode (use the UP/DOWN buttons)
	gros - Gross value (command SG) net - Net value (command SN) AUeR - Average value (command SA) SAP - ADC value ALL - Data string with Gross, Net and Status (command SW) PEA - Peak value (Maximum) (command SM) HoLd - Hold value (command SH) UALL - Valley value (Minimum) (command SV) PP - Peak to Peak value (command SO) oFF - set output "1" OFF
8.5	Transmission delay Tx @ COM Port (required for some PLCs) (command TD)
	<ul style="list-style-type: none"> - Transmission delay from 000 ... 255 milliseconds
8.6	IP-Address of Ethernet Interface (command NA)
	<ul style="list-style-type: none"> - in decimal notation per 3 characters - Factory default: 192.168.0.100
8.6.x	Example for factory default - AAA.BBB.CCC.DDD
8.6.1	AAA 000 192
8.6.2	BBB 000 168
8.6.3	CCC 000 000
8.6.4	DDD 000 100

Menu 8 – Data Communication / Continuation

Remark: Activate a new setup with 1x Power OFF & ON !

8	Data Communication setup (Menu 8.1 to 8.9)
8.7	Parity Check Modbus RTU only (use the UP/DOWN buttons) No – no parity o – odd parity e – even parity
8.8	Protocol Selection Serial Port (use the UP/DOWN buttons) SER – ASCII protocol RTU – binary data protocol Remark: After changing the protocol, you have to re-start the DAD 141
8.9	Save or Restore user setup (use the UP/DOWN buttons) (commands SU / RU) STORE – Store setup in EEPROM RECALL – Restore setup from EEPROM Remark: After RECALL , for activation you have to re-start the DAD 141.










7.11. Factory Default via Front Panel



While Power ON the DAD 141, press the both buttons UP & DOWN simultaneously for 2 or 3 seconds for setting the device to factory default.

Note: All settings will be deleted proceeding a factory default !

7.12. Error Codes

	Zero key is not enabled (chapter 7.3, menu 1.1)
	Out of zero range. (You are trying to set a zero which is greater than $\pm 2\%$ of the upper display limit)
	N/A
	Input exceeded $\pm 3.3\text{mV/V}$
	Load cell connection fail
	Requested value out of range
	Display overload – see menu 3.1o
	Display underload – see menu 3.1u
	The Zero or Tare motion limit has been exceeded. Set Zero or Tare function disallowed. Review Zero and Tare motion limits set in menu 4.4.

8. Examples

8.1. Example 1 – Calibration procedure using weights

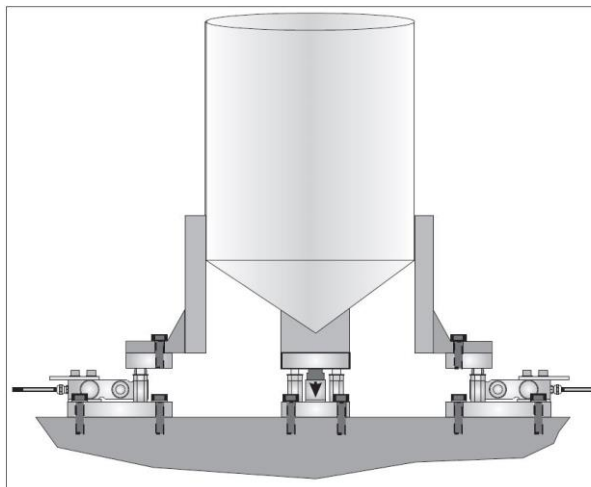
3 Leg tank or silo fitted with 3 load cells of 1000kg;
load cell signal @ 1000kg = 2 mV/V.

Dead load of tank / silo is 600kg.

Live range is 1 500kg, step size is 0.5kg.

It is assumed that the load cell system is connected to the DAD 141.1 and the power is on. The maximum and minimum display values, display increment size and decimal point position should be defined prior to carrying out the calibration (See chapter 7.5 menu 3).

For this example the display maximum is defined as 1600.0kg, the display minimum is -200.0kg, the Display step size is 0.5kg.



Remember that all parameters of the menus 1.1 - 1.3, 2.1 - 2.3 and 3.1 - 3.3 can only be accessed or changed after remove the jumper on the seal switch pins (28).

- a** A scale calibration by using weight(s) can **only** be performed in the scale status 'no motion'. This requires in any case to check the settings of menu 4.

Recommendations for setup as follows:

- Menu 4.1: set cut off frequency to $4.1.7 = 0.5\text{Hz}$
- Menu 4.2: choose IIR filter
- Menu 4.4.1: set no motion range e.g. to 2, which means for this example 0.2kg
- Menu 4.4.2: set no motion time to 1000, which means 1000ms or 1s

In case of outdoor application or indoor with a lot of mechanical noise from the floor/ground, may be you have to change the 'no motion' settings.

- b** Go to Menu 3.2 (display step size) by using the **UP/DOWN** and **ZERO** keys. The display shows the actual step size, e.g. 1. Now you can change step size by using the **UP/DOWN** keys and set to 5. Press the **ZERO** key to store & leave menu point. This procedure defines the step size to 5, which leads with the setup of decimal point to 0.5kg steps.
- c** Go to Menu 3.3 (decimal point position) by using the **UP/DOWN** and **ZERO** keys. The display shows the actual decimal point, e.g. 0.0. Now you could change decimal point position by using the **UP/DOWN** keys, but in this example we keep the setup. Press the **ZERO** key to store & leave menu point. This procedure defines the decimal point position to 0.0, which leads to weight readings of e.g. 498.5kg.
- d** Go to Menu 1.2 by using the **UP/DOWN** and **ZERO** keys. The display shows the actual mV/V value, e.g. 0.4107. Make sure that the tank/silo is empty or at the point where you want the display to read zero. Press the **ZERO** key to set the display to read 0000.0kg. This procedure defines the actual zero calibration point. Leave this menu point with **ZERO** key.
- e** Go to Menu 2.1 by using the **UP/DOWN** and **ZERO** keys. Set the display to read the span value of the calibration weight(s) applied. For this example, if the calibration applied load is 750kg, set the display to read 750.0. By using the **UP/DOWN** and **TARE** keys you have to setup each number of the 6 digit display to 00750.0. Press now **ZERO** key for storage. This procedure defines the span calibration value. Leave this menu point with **ZERO** key.
- f** Go to Menu 2.2. by using the **UP/DOWN** and **ZERO** keys. Apply the calibration weight(s) to the weighing system. The display will show the actual input signal in mV/V, e.g. 0.9087. Press the **ZERO** key to set the display to read 750.0kg. The gravimetric calibration is done. Leave this menu point with **ZERO** key.

- g** The last point for this example are the settings of over/under range.
Go to Menu 3.1 (over/under range) by using the **UP/DOWN** and **ZERO** keys.
Press **ZERO** key again for setup over range (3.1.o) or additional with **UP** key under range (3.1.U).
The display shows in both cases 099999.9. By using the **UP/DOWN** and **TARE** keys you have to setup each number of the 6 digit display to 01600.0 for over range and 00200.0 for under range. As default, the under range value is always negative, shown through the '-' LED in the display (left lower corner).
Leave each menu point with the **ZERO** key.
This procedure defines the over range to 1600.0, which leads @ weight readings of >1600.0kg to all upper LEDs of the 6 display numbers.
This procedure defines the under range to -200.0, which leads @ weight readings of <-200.0kg to all lower LEDs of the 6 display numbers.

Press the **TARE** key two or three times and the DAD 141.1 will be back in weighing mode.

Calibration is now completed and stored. Please switch 1x OFF/ON for new TAC value.

Remark

After calibration procedure you can adjust the filter settings back to your application.

As rule of thumb you can calculate the weight/force true value of nearly 100% as 1/cut off frequency.

Examples:

- fcut = 0.5Hz means it takes about 2 seconds for the true value – the value will increase while these 2 seconds to the true value.
- fcut = 8Hz means it takes about 0.125 seconds for the true value – the value increase take only 125 milliseconds.

8.2. Example 2 – Calibration procedure using load cell's mV/V sensitivity

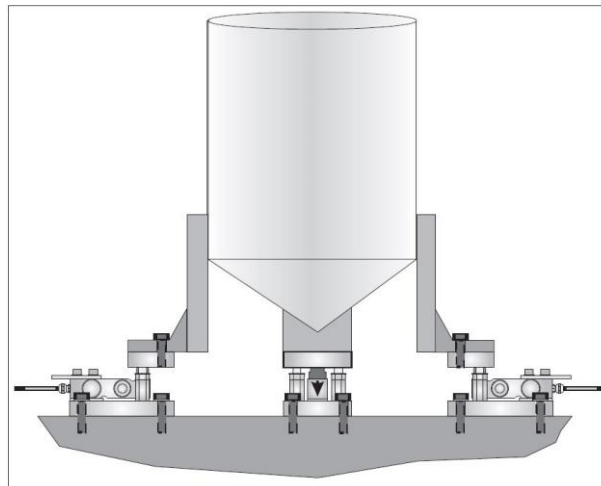
3 Leg tank or silo fitted with 3 load cells of 1000kg;
load cell signal @ 1000kg = 2 mV/V.

Dead load of tank / silo is 600kg.

Live range is 1500 kg, step size is 0.5kg.

It is assumed that the load cell system is connected to the DAD 141.1 and the power is on. The maximum and minimum display values, display increment size and decimal point position should be defined prior to carrying out the calibration (See chapter 7.5 menu 3).

For this example the display maximum is defined as 1600.0kg, the display minimum is -200.0kg, the Display step size is 0.5kg.



Remember that all parameters of the menus 1.1 - 1.3, 2.1 - 2.3 and 3.1 - 3.3 can only be accessed or changed after remove the jumper on the seal switch pins (28).

- a** A scale calibration by using weight(s) can only be performed in the scale status 'no motion'. This requires in any case to check the settings of menu 4.

Recommendations for setup as follows:

- Menu 4.1: set cut off frequency to $4.1.7 = 0.5\text{Hz}$
- Menu 4.2: choose IIR filter
- Menu 4.4.1: set no motion range e.g. to 2, which means for this example 0.2kg
- Menu 4.4.2: set no motion time to 1000, which means 1000ms or 1s

In case of outdoor application or indoor with a lot of mechanical noise from the floor/ground, may be you have to change the 'no motion' settings.

- b** Go to Menu 3.2 (display step size) by using the **UP/DOWN** and **ZERO** keys. The display shows the actual step size, e.g. 1. Now you can change step size by using the **UP/DOWN** keys and set to 5. Press the **ZERO** key to store & leave menu point. This procedure defines the step size to 5, which leads with the setup of decimal point to 0.5kg steps.
- c** Go to Menu 3.3 (decimal point position) by using the **UP/DOWN** and **ZERO** keys. The display shows the actual decimal point, e.g. 0.0. Now you could change decimal point position by using the **UP/DOWN** keys, but in this example we keep the setup. Press the **ZERO** key to store & leave menu point. This procedure defines the decimal point position to 0.0, which leads to weight readings of e.g. 498.5kg.
- d** Go to Menu 1.3 (cal. zero in mV/V) by using the **UP/DOWN** and **ZERO** keys. The display shows the actual mV/V value, e.g. 0.4107. Make sure that the tank/silo is empty or at the point where you want the display to read zero. Press the **ZERO** key to set the display reading to 0000.0kg. This procedure defines the actual zero calibration point. Leave this menu point with **ZERO** key.

In case you want to setup absolute zero to 00.0000mV/V, you can do this via **ZERO** key and using **UP/DOWN** and **TARE** keys etc.

- e** Go to Menu 2.1 by using the **UP/DOWN** and **ZERO** keys. Set the display to read the span value @ summary of load cell capacity. For this example, we use 3 load cells with 1000kg capacity each, set the display to read 3000.0. By using the **UP/DOWN** and **TARE** keys you have to setup each number of the 6 digit display to 03000.0. Press now **ZERO** key for storage. This procedure defines the span calibration value. Leave this menu point with **ZERO** key.

- f** Go to Menu 2.3. by using the **UP/DOWN** and **ZERO** keys. The display shows 00.000mV/V. The load cells signal @ 3000kg is e.g. 2.0123mV/V ((signal #1 + signal #2 + signal #3) / 3). By using the **UP/DOWN** and **TARE** keys you have to setup each number of the 6 digit display to 02.0123. Press the **ZERO** key to set the display to read 3000.0kg. The electronic span calibration is done.
Leave this menu point with **ZERO** key.

The mV/V setting conform to our example with 1500kg live range means, we would have to setup only 01.0062 – which is 50% of mV/V @ 3000kg.

- g** The last point for this example are the settings of over/under range.
Go to chapter 7.4 menu 3.1 (over/under range) by using the **UP/DOWN** and **ZERO** keys.
Press **ZERO** key again for setup over range (3.1.o) or additional with **UP** key under range (3.1.U).
The display shows in both cases 099999.9. By using the **UP/DOWN** and **TARE** keys you have to setup each number of the 6 digit display to 01600.0 for over range and 00200.0 for under range. As default, the under range value is always negative, shown trough the '-' LED in the display (left lower corner).
Leave each menu point with the **ZERO** key.
This procedure defines the over range to 1600.0, which leads @ weight readings of >1600.0kg to all upper LEDs of the 6 display numbers.
This procedure defines the under range to -200.0, which leads @ weight readings of <-200.0kg to all lower LEDs of the 6 display numbers.

Press the **TARE** key two or three times and the DAD 141.1 will be back in weighing mode.

Calibration is now completed and stored. Please switch 1x OFF/ON for new TAC value.

Remark

After calibration procedure you can adjust the filter settings back to your application.
As rule of thumb you can calculate the weight/force true value of nearly 100% as 1/cut off frequency.
Examples:

- fcut = 0.5Hz means it takes about 2 seconds for the true value – the value will increase while these 2 seconds to the true value.
- fcut = 8Hz means it takes about 0.125 seconds for the true value – the value increase take only 125 milliseconds.

Practicle Hint

A mix between gravimetric & electronic calibration is possible, too. For silos or tanks can a complete gravimetric calibration lead to a problem when you have to apply e.g. 50 tons. In such a case we recommend to calibrate zero gravimetrically (dead load of silo / tank) and span electronically (average mV/V values of load cells).

9. Commands – Overview

Command	Short description	Parameter value	Page
AA	Get/set analog output action (base)	0 through 8	48
AD	Communication: Device Address	0...255	47
AG	Absolute gain calibration	± 32000	34
AH	Get/set analog high	-999999 to 999999	48
AI'n'	Assign Input 'n' to 1 out of 15 different functions/base	0 to 15	43
AL	Get/set analog low	-999999 to 999999	48
AM	Analog Output Mode Current / Voltage	0 to 5	48
A'n'	Action for Setpoint 'n': choose 0 of 8 different base for setpoint 'n'	0 to 8	45
AS	Save analog output parameters	none	49
AZ	Absolute zero point calibration	± 32000	34
BR	Communication: Baud Rate	9600...115200 baud	47
CE	Calibration: Open Calibration Sequence; Read TAC Counter	0...65535	31
CG	Calibration: Set Calibration Gain (Span) at Load > Zero	1...999999	32
CI	Calibration: Minimum Output Value	-999999...0	31
CL	Communication: Close Device	None	47
CM	Calibration: Set Maximum Output Value	1...999999	31
CS	Save the Calibration Data (CM, CI, DS, DP, etc.) to the EEPROM	None	34, 49
CZ	Calibration: Set Calibration Zero Point – Scale Without Load	None	32
DP	Calibration: Set Decimal Point Position	0...5	32
DS	Calibration: Set Display Step Size	1, 2, 5, 10, ..., 500	32
DX	Communication: Set full-duplex (1) or half duplex (0)	0 or 1	47
FD	Factory default settings: Write Data to the EEPROM (TAC protected)	None	33
FM	Read / modify filter mode: IIR (0) or FIR (1)	0 or 1	36
FL	Digital low pass filter: Filter Cut-off Frequency	0...8	36
GA	Output: Get Triggered Average Value	None	41, 50
GG	Output: Get Gross Value	None	40
GH	Get Hold Value	None	41
GI	Retrieves an image file from the DAD141.1's EEPROM	None	49
GN	Output: Get Net Value	None	40
GM	Get Peak (Maximum) Value	None	41
GO	Get Peak tp Peak Value	None	41
GS	Output: Get ADC Sample Value	None	40
GT	Output: Get Tare Value	None	40
GV	Get Valley Value	None	41
GW	Output: Get Data String "Net/Gros/Status"	None	40
H'n'	Hysteresis for Setpoint H0 (S0) or H1 (S1) or H2 (S2)	-9999...+9999	45
HT	Trigger function: Hold time for Violation of Setpoint Limit	0...65535 ms	46
ID	Device information: Identify Device	None	30
IH	Hardware version	None	30
IN	Logic input: for each Input Status 0 or 1	0000...0011	43
IO	Logic output: for each Output Status 0 or 1	0000...0111	44
IS	Device information: Identify Device Status	None	30
IV	Device information: Identify Firmware Version	None	30
MT	Trigger function: Measuring Time for Averaging	0...3000 ms	50
NA	Network Address <aaa.bbb.ccc.ddd>	e.g. 192.168.0.100	47
NR	Motion detection: No-motion Range	0...65535 d	35
NT	Motion detection: No-motion Time Period	0...65535 ms	35

Command	Short description	Parameter value	Page
OM	Output Mask – to control hy host	0000...0111	44
ON	Open Net weight of device 'n'	0...255	40
OP	Open Device	0...255	47
PI	Download a saved image file to the DAD 141.1's EEPROM	Image data string	49
P'n'	Polarity of Setpoint 'n', n= 0, 1 or 2: On / Off	0 or 1	46
RM	Reset Peak (Maximum) Value	None	41
RS	Device information: Read serial number	None	31
RT	Scale function: Reset Tare and Switch to Gross Indication	None	38
RZ	Scale function: Reset Zero Point	None	38
SA	Auto-transmit: Send Triggered Average Value automatically	None	42, 51
SD	Trigger function: Start Delay	0... 500 ms	50
SG	Auto-transmit: Send Gross Value continuously	None	42
SH	Auto-transmit: Send Hold Value	None	42
SM	Auto-transmit: Send Peak (Maximum) Value	None	42
SN	Auto-transmit: Send Net Value continuously	None	42
S'n'	Setup of Setpoints S0, S1 and S2	-999999...+999999	45
SO	Auto-transmit: Send Peak to Peak Value	None	42
SR	Reset Firmware (Warm Start)	None	31
SS	Save the Setpoint Data (S'n', H'n', P'n', A'n') to the EEPROM	None	49
ST	Scale function: Set Tare and Switch to Net Indication	None	38
SV	Auto-transmit: Send Valley Value	None	42
SW	Auto-transmit: Send Data String „Net/Gross/Status“ continuously	None	42
SZ	Scale function: System Zero Point	None	38
TD	Communication: Transmission delay	0...255 ms	47
TE	Trigger function: Trigger on Rising Edge (1) or Falling Edge (0)	0 or 1	50
TH	Trigger Hold (save the actual weight/reading)		41
TI	Trigger function: Averaging Time for Automatic Taring	0...65535 ms	39
TL	Trigger function: Trigger Level	0...999999	51
TN	Non Volatile Tare value ON/OFF @ power OFF	0 or 1	38
TR	Trigger function: Software Trigger	None	50
TW	Trigger function: Window for Automatic Taring	0...65535	39
UR	Update Rate (average of 2 exp. 'n' values – 2 exp 7 = 128)	0...7	37
WP	Save the Setup Data (FL, NR, NT, AD, BR, DX) to the EEPROM	None	49
ZI	Initial Zero Setting ON/OFF	0 or 1	33
ZN	Non Volatile Zero Value ON/OFF @ power OFF	0 or 1	39
ZR	Calibration: Zero Range	0...999999	33
ZT	Zero Tracking – disable (0), enable (1 – legal for trade) or 2 ...255	0...255	33
	New Commands		
SU	Store User Setup incl. calibration non-volatile in EEPROM	None	34
RU	Restore User Setup to DAD 141.1	None	34



10. Commands Description

For better clarity, all commands are divided into groups as described on the following pages. Each command has to be completed with a CR (Enter), which is shown in the following tables as “↵”.

For each command, the Modbus Index is displayed in brackets [[Index 0xNNNN](#)] and explained in the separate manual ‘Modbus Communication’. If case of no index mentioned, the command is not available for Modbus RTU or TCP.

10.1. System Diagnosis Commands – ID, IH, IV, IS, SR, RS

Use these commands you get the DAD 141.1 type, firmware version or device status. These commands are sent without parameters.

10.1.1. ID Get Device Identity [[Index 0x202C](#)]

Master (PC / SPS) sends	Slave (DAD 141.1) responds
ID↵	D:1410

The response to this request gives the actual identity of the active device. This is particularly useful when trying to identify different device types on a bus.

10.1.2. IH Get Hardware Version

Master (PC / SPS) sends	Slave (DAD 141.1) responds
IH↵	H:14100101FFFFFFFFFFFFFF...

10.1.3. IV Get Firmware Version [[Index 0x202E](#)]

Master (PC / SPS) sends	Slave (DAD 141.1) responds
IV↵	V:0104

The response to this request gives the firmware version of the active device.

10.1.4. IS Get Device Status [[Index 0x2030](#)]

Master (PC / SPS) sends	Slave (DAD 141.1) responds
IS↵	S:067000 (example)

The response to this request comprises of two 3-digit decimal values (001 and 000), which can be decoded according to the table below:

Leftmost 3-digit value		Rightmost 3-digit value	
1	Signal stable (no motion)	1	(not used)
2	Zeroing action performed	2	(not used)
3	Tare active	3	(not used)
4	(not used)	4	(not used)
8	(not used)	8	(not used)
16	(not used)	16	(not used)
32	(Setpoint-) output 0 active	32	(not used)
64	(Setpoint-) output 1 active	64	(not used)
128	(Setpoint-) output 2 active	128	(not used)

The example decodes the result S: 067000 (binary 01000011) as follows:

- Signal stable (no motion) [$2^0 = 1$, LSB]
- Zeroing action performed [$2^1 = 2$]
- Tare not active [= 0]
- Output 0 active [= 0]
- Output 1 active [$2^6 = 64$]
- Output 2 not active [= 0]

Note: The bits that are not used are set to zero.

10.1.5. SR Reset DAD 141.1 Firmware

Master (PC / SPS) sends	Slave (DAD 141.1) responds
SR↵	OK

This command will respond with 'OK' and after maximum 400 ms perform a complete reset of the DAD 141.1. It has the same functionality as power OFF and ON again.

10.1.6. RS Read Serial Number

[[Index 0x2034](#)]

Issuing the RS command will return the current serial number in the format S+12345678.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
RS↵	S+00147301	Serial Number: 0147301

10.2. Calibration Commands – CE, CM, CI, DS, DP, CZ, CG, ZT, FD, ZR, ZI, AZ, AG, CS, SU, RU

10.2.1. CE Read TAC* Counter / Open Calibration Sequence [[Index 0x2204](#)]

With this command you can read the TAC counter (*TAC = Traceable Access Code) or you can open a calibration sequence.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active

This command must be issued PRIOR to any attempt to set the calibration parameters AG, AZ, CM, CI, DS, DP, CZ, CG, ZT, ZR, FD or CS. In legal for trade applications the TAC counter can be used to check if critical parameters have been changed without re-verification. After each calibration the TAC counter increases by 1.

10.2.2. CM Set Maximum Output Value

[[Index 0x220C](#)]

This command is used to set up the maximum output value. Permitted values are from 1 to 999 999.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CM↵	M+050000	Request: CM = 50000 d
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
CM 30000↵	OK	Setup: CM = 30000 d

This value will determine the point at which the output will change to "oooooooo", signifying over-range.

Note: The range, in which a scale can be set to zero (SZ) or automatic zero tracking (ZT) is active, is as standard +/- 2% of CM value. But with the settings of ZT (see 10.2.8) and/or ZR (see 10.2.10) you can change the behaviour.

Factory default: CM = 010009

10.2.3. CI Set Minimum Output Value

[[Index 0x220E](#)]

This command is used to set up the minimum output value. Permitted values are from – 999 999 to 0.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CI↵	I-010009	Request: CI = –10009 d
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
CI -100↵	OK	Setup: CI = –100 d

This value will determine the point at which the output will change to "uuuuuuu", signifying under-range.

Note: In bipolar applications (e.g. force- or torque measurements) this parameter defines the max. output value for input signals with negative sign.

Factory default: CI = –010009

10.2.4. DS Set Display Step Size [\[Index 0x2216 \]](#)

This command allows the output to step up or down by a unit other than 1.
Permitted values are 1, 2, 5, 10, 20, 50, 100, 200 and 500.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
DS↵	S+00002	Request: Step size 2
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
DS 50↵	OK	Setup: Step size 50

Legal for trade applications allow for up to 10000 intervals. The allowed step size has to be considered.

Factory default: DS = 00001

10.2.5. DP Set Decimal Point Position [\[Index 0x2214 \]](#)

This command allows the decimal point to be positioned anywhere between leftmost and rightmost digits of the 5-digit output result. Permitted values are 0, 1, 2, 3, 4, 5. Position 0 means no decimal point.

Factory default: DP = 00000

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
DP↵	P+00003	Request: Position of decimal point 3
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
DP 0↵	OK	Setup: no decimal point

10.2.6. CZ Set Calibration Zero Point [\[Index 0x2212 \]](#)

This is the reference point for all weight calculations, and is subject to TAC control.

Factory default: approx. 0 mV/V input signal

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
CZ 0↵	OK	Zero point saved

10.2.7. CG Set Calibration Gain (Span) [\[Index 0x2206 \]](#)

This is the reference point for calibration with load, and is subject to TAC control.

Permitted values are from 1 to 999 999.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CG↵	G+010000	Request: Calibration weight = 10000 d
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
CG 15000↵	OK	Setup: Calibration weight = 15000 d

For calibrating an input signal near the display maximum (CM) will give the best system performance. The minimum calibration load of at least 20% is recommended. Is the calibration weight smaller than 1% of display maximum (CM), the DAD 141.1 will respond with an error message ("ERR").

Factory default: 10000 = 2.000 mV/V input signal

10.2.8. ZT Zero Tracking

[[Index 0x2122](#)]

This command enables / disables the zero tracking function. ZT = 0 disables the zero tracking, ZT = 1 or higher enables the zero tracking, independent of decimal point setting. Issuing the command without any parameter returns the current ZT value. Permitted values are 0 to 255.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
ZT↵	Z:001	Request: ZT status
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
ZT 0↵	OK	Setup: ZT = Disabled

ZT = enabled - performed only on results less than $\pm ZT$ range at a rate of 0.4d/sec.

ZT = 1 means ± 0.5 d

ZT = 100 means ± 50 d

Factory default: ZT = 1 [Enabled]

10.2.9. FD Reset to Factory Default Settings

[[Index 0x2066](#)]

This command puts the DAD 141.1 back to a known state. The factory default settings data will be written to the EEPROM and the TAC will be incremented by +1.

Note: All calibration and setup settings will be lost by issuing this command!

The user setup - stored via command SU – will be not overwritten and remains untouched.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
FD↵	OK	Factory default setting

10.2.10. ZR Zero Range

[[Index 0x2220](#)]

Sets the zero range manually – this is the range in divisions within which the weighing scale can be zeroed. Issuing the ZR command without any parameter will return the current value.

Permitted values are 0 to 999 999.

A value of zero 0 disables the zeroing of the scale.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
ZR↵	R+002000	Request: ZR = 2000 d
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
ZR 100↵	OK	Setup: Zero range = 100 d

Factory default: ZR = 0

10.2.11. ZI Initial Zero ON / OFF

[[Index 0x221E](#)]

Can proceed an initial zero @ power ON.

Permitted values are 0 (OFF) or 1 (ON).

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
ZI↵	Z:001	Request: ZI = 1 (ON)
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
ZI 0↵	OK	Setup: Initial Zero is OFF

Factory default: ZI = 0

10.2.12. AZ Absolute zero point calibration (eCal) [[Index 0x2202](#)]

The command AZ is used as reference point for all weight calculations and will setup in mV/V. Permitted values are $\pm 32\,000$ ($= \pm 3.2000$ mV/V).

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
AZ↵	Z+0.2796	Request: Zero point @ 0.2796 mV/V
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
AZ_00500↵	OK	New: Zero point @ 0.0500 mV/V

Factory default: 00000d @ 0.0000mV/V input signal.

10.2.13. AG Absolute gain calibration (eCal) [[Index 0x2200](#)]

The command AG is used as absolute gain (or measuring range) for all weight calculations and will setup in mV/V. Permitted values are $\pm 32\,000$ ($= \pm 3.2000$ mV/V).

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
AG↵	G+0.1868	Request: gain 10 000d @ 0.1868 mV/V
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
AG_+011200_+005000↵	OK	New: gain 5 000d @ 1.12 mV/V

Factory default: 20 000d @ 2.0000mV/V input signal.

10.2.14. CS Save the Calibration Data [[Index 0x2066](#)]

This command results in the calibration data being saved to the EEPROM and causes the TAC to be incremented by 1.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Calibration sequence active
CS↵	OK	Calibration values saved

The CS command saves all of the calibration group values, as set by AG, AZ, CZ, CG, CM, DS, DP and ZT. The command returns ERR and has no updating action unless it is preceded by the CE_XXXXX.

10.2.15. SU Save User Setup in EEPROM

This command saves all the setup data including calibration non-volatile in EEPROM. In delivery status the user setup contains the factory default settings (as FD command).

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Store sequence active
SU↵	OK	User setup stored in EEPROM

10.2.16. RU Restore User Setup to DAD 141.1

This command restores the user setup including the calibration from the EEPROM, the TAC counter is increased by +1. To activate, the SR command (warm start) must be performed or just re-start the DAD 141.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CE↵	E+00017 (example)	Request: TAC counter CE17
CE 17↵	OK	Restore sequence active
RU↵	OK	Restore from EEPROM
SR↵	OK	Activate restored user setup

10.3. Motion Detection Commands – NR, NT

The motion detection facility provides a means of disabling certain functions whenever a condition of instability, or “motion”, is detected. The “no-motion”, or “stable” condition is achieved whenever the signal is steady for the period of time set by NT, during which it cannot fluctuate by more than NR increments. The stable condition activates the relevant bit of responses to “Info Status” (IS).

Following functions are disabled if motion is detected: “Calibrate Zero” (CZ) “Calibrate Gain” (CG) “Set Zero” (SZ) and “Set Tare” (ST). After such a command the system returns an error (“ERR”), if the signal is not stable.

10.3.1. NR Set ‘No-motion’ Range

[[Index 0x2112](#)]

This is the range within which the weighing signal is allowed to fluctuate and still be considered as “stable”. Permitted values are from 1 to 65535.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
NR↵	R+00010	Request: NR = 10 d
NR 2↵	OK	Setup: NR = 2 d
WP↵	OK	Setup saved

Example: For NR = 2 the fluctuations within a maximum of ± 2 d, in the period NT, will be considered “stable”.

Factory default: NR = 1 [= ± 1 d]

10.3.2. NT Set ‘No-motion’ Time Period

[[Index 0x2114](#)]

This is the time period (in milliseconds) over which the weight signal is checked to see if it is “stable” or has “no-motion”. The weight signal has to vary by less than NR divisions over the time period NT to be considered ‘stable’.

Permitted values are from 1 to 65535.

Master (PC / SPS) sends	Slave (WCN-H 122.1) responds	Meaning
NT↵	T+01000	Request: NT = 1000 ms
NT 500↵	OK	Setup: NT = 500 ms
WP↵	OK	Setup saved

If the value of NT = 500 milliseconds, the output must not fluctuate more than NR increments within 500 milliseconds in order to be considered “stable”.

Factory default: NT = 1000 [ms]

10.4. Filter Setting Commands – FM, FL, UR

A digital filter can be set which will eliminate most of the unwanted disturbances. The commands **FM** and **FL** are used to define the digital filter settings, the command **UR** is used to define an averaging of up to 128 measurement values. Please note that these filters are positioned immediately after the A/D Converter and therefore affect all aspects of the weighing operation.

10.4.1. FM Filter Mode

[[Index 0x2110](#)]

This command defines the filter mode. Choose the filter mode for your application.

Permitted values are “0” for IIR filter and “1” for FIR filter.

Master (PC / SPS) sends	Slave (WCN-H 122.1) responds	Meaning
FM ↵	M+00000	Request: FM = 0 (IIR filter)
FM 0 ↵	OK	Setup: FM = 0 (IIR filter)
WP ↵	OK	Setup saved

The digital IIR filter operates as 2nd order low pass filter and Gaussian characteristics. The attenuation is 40dB/decade (12 dB/octave).

The digital FIR filter works as a low-pass filter with quick response; damping see table mode 1.

Factory default: FM = 0 (IIR filter)

10.4.2. FL Filter Settings

[[Index 0x2106](#)]

This command defines the 3dB filter cut-off frequency.

Master (PC / SPS) sends	Slave (WCN-H 122.1) responds	Meaning
FL ↵	F+00003	Request: FL = 3 (4 Hz)
FL 7 ↵	OK	Setup: FL = 7 (0.5 Hz)
WP ↵	OK	Setup saved

The permitted settings are from 0 and 8 (see below table).

Factory default: FL = 3.

Mode 0 (IIR filter) Settings / Characteristic

FL	Settling time to 0.1% (ms)	3dB Cut-off frequency (Hz)	Damping @300Hz (dB)	Output-rate* (samples/s)
0	no filtering	**		600
1	55	18	57	600
2	122	8	78	600
3	242	4	96	600
4	322	3	104	600
5	482	2	114	600
6	963	1	132	600
7	1923	0.5	149	600
8	3847	0.25	164	600

* Output-rate = 600/2^{UR} samples/s

** Antialiasing filter 17 Hz @ 60 dB/dec

Mode 1 (FIR filter) Settings / Characteristic

FL	Settling time to 0.1% (ms)	3 dB Cut-off frequency (Hz)	20 dB damping at frequency (Hz)	40 dB damping at frequency (Hz)	Damping in the stopband (dB)	Stopband (Hz)	Output rate max. (samples/s)
0	no filtering	**					600
1	47	19.7	48	64	>90	>80	600
2	93	9.8	24	32	>90	>40	300
3	140	6.5	16	21	>90	>26	200
4	187	4.9	12	16	>90	>20	150
5	233	3.9	10	13	>90	>16	120
6	280	3.2	8	11	>90	>13	100
7	327	2.8	7	9	>90	>11	85.7
8	373	2.5	6	8	>90	>10	75

** Antialiasing filter 17 Hz @ 60 dB/decade

Attention: In mode 1 the output rate is dependant on the selected filter level (FL) and will be automatically adjusted by the DAD 141.1.

10.4.3. UR Update Rate and Averaging

[[Index 0x2120](#)]

Depending on the selected filter mode this command defines an averaging for the output value. The permitted settings are from 0 to 7 (see table below). The average value will always be calculated from 2^{UR} measurement values.

DAD 141.1 allows for the following settings:

UR	0	1	2	3	4	5	6	7
Average of 2 ^{UR} values	1	2	4	8	16	32	64	128

Check / Setup of the averaging:

Master (PC / SPS) sends	Slave (WCN-H 122.1) responds	Meaning
UR←	U+00003	Request: Averaging of 8 values
UR 7←	OK	Setup: Averaging of 128 values
WP←	OK	Setup saved

Factory default: 0 (no averaging, means 600 samples/sec)

Remark to Mode 1

Dependency Output Rate - averaging UR - Filter FL

UR	Output Rate samples/s								
	FL0	FL1 19.7 Hz	FL2 9.8 Hz	FL3 6.5 Hz	FL4 4.9 Hz	FL5 3.9 Hz	FL6 3.2 Hz	FL7 2.8 Hz	FL8 2.5 Hz
0	600	600	300	200	150	120	100	85.7	75
1	300	300	150	100	75	60	50	42.85	37.5
2	150	150	75	50	37.5	30	25	21.42	18.75
3	75	75	37.5	25	18.75	15	12.5	10.71	9.38
4	37.5	37.5	18.75	12.5	9.38	7.5	6.25	5.36	4.69
5	18.75	18.75	9.38	6.25	4.69	3.75	3.13	2.68	2.34
6	9.38	9.38	4.69	3.13	2.34	1.88	1.56	1.34	1.17
7	4.69	4.69	2.34	1.56	1.17	0.94	0.78	0.67	0.59

10.5. Taring and Zeroing Commands – SZ, RZ, ZN, ST, RT, TN, RW, TI

The following commands allow you to set and reset the zero and tare values. The zero set up during calibration remains the 'true zero' but the new 'current zero' can be set up by using the SZ command. If the SZ command is issued and accepted then all weight values will then be based on the new 'current zero'. Please remember that the zero value will be subject to the Zero tracking function if enabled. If the weight signal is not stable (as defined by the 'No motion' range NR and the 'No motion' time NT) then both, the set zero SZ and set tare ST commands, will be disabled.

See chapter 11 - Use in "Approved" applications.

10.5.1. SZ Set System Zero [[Index 0x2061](#)]

This command sets a new "current zero" which is then the basis of all weight values until further updated by the zero tracking function, another SZ command or the "reset zero" command RZ.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SZ↵	OK	Set zero performed

The SZ command will fail (DAD 141.1 responds with ERR) if the new "current zero" is outside the active +/- zero range set with the ZR command. The SZ command will also fail if the weight signal is not stable as defined by the No motion range (NR) and the No motion time (NT). If the weight signal is "stable", the response to the IS command (Device Status) will show the "signal stable" bit active and the SZ command will be accepted (OK). If the "signal stable" bit is not active, the SZ command will be rejected and the DAD 141.1 will respond with ERR (error).

10.5.2. RZ Reset Zero [[Index 0x2061](#)]

This command cancels the SZ command and the zero reading reverts to that set by the CZ command during calibration.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
RZ↵	OK	Zero point CZ active

The DAD 141.1 responds to the RZ command with either OK or ERR. If OK is returned then the "zero action performed" bit in the Device Status (IS) response will be set to "0".

10.5.3. ZN Store Zero Value [[Index 0x2226](#)]

This command allows to store the zero value non volatile @ power off of the DAD 141.1.

Permitted values are 0 (off) and 1 (on).

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
ZN↵	Z:000	Zero @ power off: OFF
ZN_1	OK	Setup: Zero @ power off: ON

10.5.4. ST Set Tare [[Index 0x2061](#)]

This command will activate the net weighing function by storing the current weight value as a tare value. The weight signal must be "stable" within the limits set by NR (No Motion Range) and NT (No Motion Time) commands for the "signal stable" bit to be active and set tare command to be accepted.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
ST↵	OK	Tare performed / Net operation

If the weight signal is "stable", the response to the IS command (Device Status) will show the "signal stable" bit active and the ST command will be accepted (OK). If the "signal stable" bit is not active, the ST command will be rejected and the DAD 141.1 will respond with ERR (error).

10.5.5. RT Reset Tare [[Index 0x2061](#)]

This command resets the tare and the weighing signal returns to gross mode.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
RT↵	OK	Tare de-activated / Gross operation

The DAD 141.1 responds to the RT command with either OK or ERR. If OK is returned then the "tare active" bit in the Device Status (IS) response will be set to "0".

10.5.6. TN Store Tare Value

[[Index 0x2224](#)]

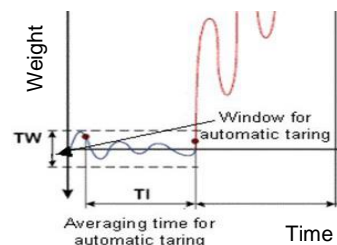
This command allows to store the tare value non volatile @ power off of the DAD 141.1.
Permitted values are 0 (off) and 1 (on).

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
TN↵	T:000	Tare @ power off: OFF
TN_1	OK	Setup: Tare @ power off: ON

10.5.7. TW Window for Automatic Taring

[[Index 0x240A](#)]

This command defines an amplitude window for the automatic taring. The setting TW = 100 means, that the system calculates a new tare value, if the averaged net value of the empty scale falls within 100 digits of the net zero point. The new tare value will be averaged over the time period TI (see below). If the averaged tare value falls outside this window, then the tare value will not be updated.



Permitted values are from 0 to 65535.

Default setting: TW = 0 [= automatic taring disabled]

Master (PC / SPS) sends	Slave (WCN-H 122.1) responds	Meaning
TW↵	W+00000	Request: TW = 0 d
TW 100↵	OK	Setup: TW = 100 d

10.5.8. TI Averaging Time for Automatic Taring

[[Index 0x240C](#)]

This command defines the averaging time for the automatic taring. Within this time period the system calculates an averaged tare value.

Permitted values are from 0 to 65535.

Default setting: TI = 0 ms [= automatic taring disabled]

Master (PC / SPS) sends	Slave (WCN-H 122.1) responds	Meaning
TI↵	T+00000	Request: TI = 0 ms
TI 200↵	OK	Setup: TI = 200 ms

Remark to TW / TI:

The dynamic automatic taring (virtually) will be proceeded only in case both commands are setup with permitted values. In the case, one of both is set to "0", the automatic taring is switched off.

10.6. Output Commands – GG, GN, ON, GT, GS, GW, GA, GH, GM, RM, GO, GV

The following commands “Get’s” the gross, net, tare, ADC sample values etc. from the DAD 141.1.

10.6.1. GG Get Gross Value [[Index 0x2000 or 0x2020](#)]

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
GG↵	G+001.100	Gross value: 1.100 d

10.6.2. GN Get Net Value [[Index 0x2002 or 0x2022](#)]

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
GN↵	N+001.000	Net value: 1.000 d

10.6.3. ON Get Net Value of device 'n'

This command can be used for having quick access to all net values of some DAD 141.1 in a RS 485 network without using any other commands like Open (OP) or Close (CL)

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
ON3↵	N+001.000	Net value of # 3: 1.000 d

10.6.4. GT Get Tare Value [[Index 0x2118](#)]

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
GT↵	T+000.100	Tare value: 100 d

10.6.5. GS Get ADC Sample Value [[Index 0x202A](#)]

This command gets the actual Analogue to Digital Converter (ADC) value. This can be useful during development or when calibrating to see how much of the ADC range is being used.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
GS↵	S+125785	ADC sample value = 125785 d

For service purposes it may be helpful to note the GS values for the “no-load” or “zero” output and when the “calibration load” is applied.

10.6.6. GW Get Data String “Net, Gross and Status“ [[Index 0x3300 or 0x3500](#)]

Issuing the GW command, which has no parameters, will return the net weight, the gross weight, the status and the checksum values, all combined into one single string in the format **W+000100+001100010F**. The first two sections of the return string comprise the net weight and gross weight results, followed by two hexadecimal characters, which represent two bitmapped status indicators. The last two hexadecimal characters represent the checksum, which is the inverse of the sum of all the ASCII values of the string, not including the checksum characters.

W	+000100	+001100	0	1	0F
Leading character signifies the GW	Net weight excluding decimal point	Gross weight excluding decimal point	First bitmapped binary value	Second bitmapped binary value	Checksum

The bitmapped characters are:

First bitmapped value	description	Second bitmapped value	description
1	Not used	1	No motion
2	Output 0 active	2	Zero action performed
4	Output 1 active	4	Tare active
8	Output 2 active	8	Not used

The checksum is derived as follows:

- Add the ASCII values (in hex) of all the 15 characters in the string
- Invert the hexadecimal value
- Add one to the value
- Use only the last two digits
- Convert the hexadecimal value to characters

10.6.7. GA Get Triggered Average Value [[Index 0x2008 or 0x2028](#)]

This command reads the measurement result of a measurement cycle. The measurement value has been averaged according the defined measuring time. The trigger commands can be found in chapter 10.13.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
GA↵	A+001.100	Request: GA = 1100 g

Note: For preventing errors during the read out of the data the register GA has stored the value 99999 at the beginning of the measurement cycle. The measurement result can only be read after the defined measuring time MT has been elapsed and before a new measurement cycle has been started.

10.6.8. GH Get Hold Value [[Index 0x2084 or 0x2086](#)]

Get the actual weight value, activated by the logic inputs.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
GH↵	H+001.800	Hold value: 1800 d

10.6.9. TH Trigger Hold Value [[Index 0x2061](#)]

Saves the weight value of the last GH reading.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
TH↵	OK	Save actual weight value

10.6.10. GM Get Peak Value [[Index 0x2080 or 0x2082](#)]

The peak value is the maximum input value while your measurement.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
GM↵	M+051.100	Peak value: 51100 d

10.6.11. RM Reset Peak Value [[Index 0x2061](#)]

Resets the peak value.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
RM↵	OK	Reset Peak value

10.6.12. GO Get Peak To Peak Value [[Index 0x208C or 0x208E](#)]

The peak to peak value is the difference value between the maximum and minimum input values while your measurement.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
GO↵	O+091.100	Peak to Peak value: 91100 d

10.6.13. GV Get Valley Value [[Index 0x2088 or 0x208A](#)]

The valley value is the minimum input value while your measurement.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
GV↵	V+000.100	Valley value: 100 d

10.7. Auto-Transmit Commands – SG, SN, SW, SA, SH, SM, SO, SV

The following commands allow the gross weight or net weight values to be continuously sent. Continuous transmission starts as soon as the relevant command has been issued and finishes when any other valid command is accepted by the DAD 141.1. The data output rate will depend on the baud rate being used e.g. with a baud rate of 115200 approximately 1000 values per second can be transmitted. The output rate of DAD 141.1 is max. 600 measurement values per second.

The continuous transmission of either the gross or net values will stop when another valid command is received.

10.7.1. SG Send Gross Value continuously

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SG↵	G+001.100	Gross value: 1,100 d

10.7.2. SN Send Net Value continuously

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SN↵	N+001.000	Net value: 1,000 d

10.7.3. SW Send Data String “Net, Gross and Status” continuously

Issuing the SW command, which has no parameters, will return continuously the net weight, the gross weight, the status and the checksum values, all combined into one single string in the format **W+000100+001100010F**.

For more detailed information of the data string see command GW (chapter 10.6.6).

10.7.4. SA Send Triggered Average Value automatically

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SA↵	OK	Auto-Transmit: triggered average value

This command will start to auto-transmit the measurement value of the current trigger cycle. The trigger setup commands are described in chapter 10.13.

10.7.5. SH Send Hold Value continuously

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SH↵	H+001.100	Hold value: 1,100 d

10.7.6. SM Send Peak Value continuously

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SM↵	M+001.100	Peak value: 1,100 d

10.7.7. SO Send Peak To Peak Value continuously

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SO↵	O+001.100	Peak to Peak value: 1,100 d

10.7.8. SV Send Valley Value continuously

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SV↵	V+000.100	Valley value: 100 d

10.8. Logic Input Functions & Status – AI'n', IN

10.8.1. AI Assign input 'n'

[[Index 0x2074 and 0x2076](#)]

This command reads / setup the function of the logical inputs. The values for 'n' are 0 or 1.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
AI_1↵	I1:+00000	Reading Input 1: no function
AI_1_10↵	OK	Setup accepted
AI_1↵	I1:+00010	Input 1: display set to 'Peak to Peak' value

The 2 logic inputs 'n' can be used for the different functions:

00 - Input "n" has no function
01 - Input "n" acts as **Zero** button
02 - Input "n" acts as **Tare** button
03 - Input "n" acts as **Up arrow** button
04 - Input "n" acts as **Down arrow** button
05 - Input "n" starts the **Trigger** function
06 - Input "n" displays the **Average** value
07 - Input "n" displays the **Peak** value (maximum)
08 - Input "n" deletes the **Peak** value (maximum)
09 - Input "n" displays the **Hold** value
10 - Input "n" displays the **Peak to Peak** value
11 - Input "n" displays the **Valley** value (minimum)
12 - Input "n" disables the buttons
13 - Input "n" stores the **actual weight** (**Hold** value)
14 - Input "n" tares the displays and deletes all other values
15 - Input "n" **turn off display**

10.8.2. IN Read status of the logic inputs

[[Index 0x210C](#)]

This command reads the status of the digital inputs.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
IN↵	I:0000	Reading: Input 0 or 1 inactive
IN↵	I:0001	Reading: Input 0 active
IN↵	I:0010	Reading: Input 1 active
IN↵	I:0011	Reading: Input 0 and 1 active

The status response is in the form of a four digit code where 0 = false and 1 = true (inputs are active 'high').
The least significant bit corresponding to Input 0.

10.9. Logic Output Commands - IO, OM, S'n', H'n', P'n', A'n', HT

The definitions for this section may be changed due to the fact that the definitions of the logic outputs for the DAD 141.1, where the status depends on the weight value (setpoint) are to be defined. Each logic output can be assigned an independent setpoint value (S'n') with a corresponding hysteresis/polarity action (H'n', P'n') and allocation (A'n' – switch on the gross, net, peak, average etc. weight).

10.9.1. IO Read / Modify the Status of the logic Outputs [[Index 0x210A](#)]

This command reads and can modify the status of the logic outputs (if enabled by the OM command). The status response is in the form of a four digit code where 0 = false and 1 = true (outputs are normally open, open drain MOSFETs), the least significant bit corresponding to Output 0 etc.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
IO↵	IO:0001	Output 0 is high
IO↵	IO:0101	Outputs 0 and 2 are high
IO↵	IO:0111	Outputs 0, 1 and 2 are high

The status of the outputs can be changed by issuing the IO command with the appropriate 4 digit code e.g. IO 0001 where in this example output 0 will be activated (FET conducting). Please note that the status of the logic outputs is normally determined by the internal setpoints (see section 10.9.2) and therefore setting the logic output status using the IO commands is not allowed.

Setting

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
IO_010↵	OK	Setup output 1 is high
IO_011↵	OK	Setup outputs 0 and 1 are high
IO_111↵	OK	Setup outputs 0, 1 and 2 are high

However, the OM command can be used to allow the status of the logic outputs to be set via the IO command or set their status directly by the host application.

Factory default: IO=0000

10.9.2. OM Control of the logic outputs by the host application [[Index 0x2116](#)]

The logic outputs can be controlled by the host application (as opposed to the normal internal setpoints) if they are enabled by the OM command and the appropriate 4 digit code.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
OM↵	OM:0001	Enable Output 0
OM↵	OM:0101	Enable Outputs 0 and 2
OM↵	OM:0111	Enable Outputs 0, 1 and 2

A "1" bit in the code enables the corresponding logic output to be controlled by the host application using the IO command. A "0" in the code leaves the corresponding logic output controlled by the internal setpoint. Logic output 0 is again the least significant bit.

Setting

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
OM_010↵	OK	Enables output 1
OM_011↵	OK	Enables outputs 0 and 1
OM_111↵	OK	Enables outputs 0, 1 and 2

Note: When reading the status of the logic outputs using the IO command, the setpoint status will be returned regardless of the OM setting. Sending OM_0000 disables the external logic output control.

Factory default: OM=0000

10.9.3. A'n' Assign action for setpoint 'n' [[Index 0x2068](#)]

This command is used to release the external control of the logic outputs: read or setup

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
A1↵	A1:+00000	Output 1 based to gross value
A2↵	A2:+00002	Output 2 based to peak value
A1_1↵	OK	Output 1 set to base net value
A1↵	A1:+00001	Output 1 based to net value

Choose the base for the output 'n' like follows:

- 0 - **Gross** value
- 1 - **Net** value
- 2 - **Peak** value (Maximum)
- 3 - **Average** value
- 4 - **Hold** value
- 5 - **Peak to Peak** value
- 6 - **Valley** value (Minimum)
- 7 - **Error 4 or 5**
- 8 - set output "1" **OFF**

10.9.4. S'n' Setpoint Value [[Index 0x206C](#)]

This command is used to read or setup the 3 setpoints S0, S1 and S2. Permitted value range is +/- 999 999.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
S1↵	S1:+01500	Request: Setpoint S1 = 1500 d
S1 3000↵	OK	Setup: Setpoint S1 = 3000 d

Factory defaults: S'0' = 1000 d , S'1' = 5000 d, S'2' = 9999 d

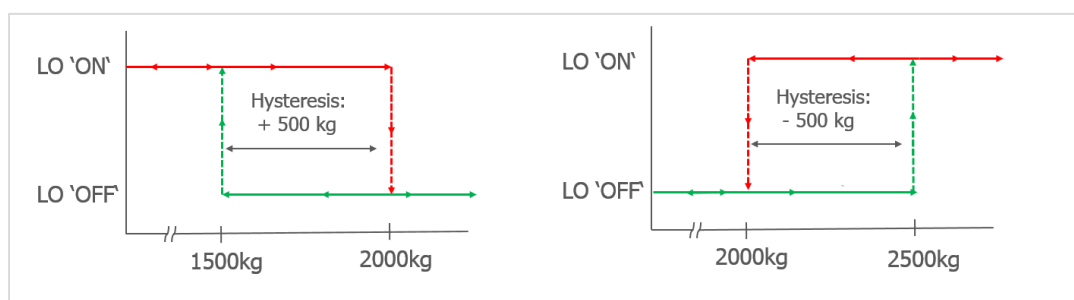
10.9.5. H'n' Setpoint Hysteresis and Switching Action [[Index 0x206A](#)]

The switching logic will be defined by the numeric value of hysteresis and the polarity.

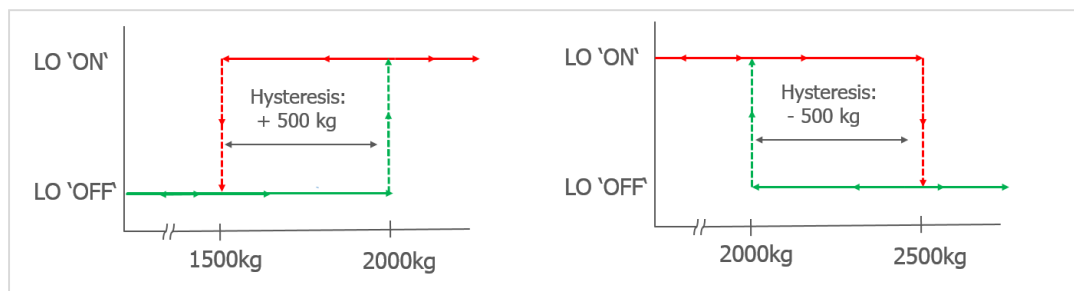
The outputs can operate as "normally closed" or "normally open", depending of the settings H'n' and P'n'.

Examples of the swichting actions for a Setpoint value of 2 000kg

Polarity = 0 [OFF]:



Polarity = 1 [ON]:



Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
H1↵	H1:+00000	Request: hysteresis setpoint S1
H1_100↵	OK	Setup: hysteresis setpoint S1 to 100 d

Allowed hysteresis values are within the range from –9999 to +9999 at a step size of 1.

10.9.6. P'n' Polarity of Setpoint

[[Index 0x2070](#)]

This command is used to setup the switch characteristic of the 3 setpoints S0, S1 and S2.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
P0↵	P0:+00000	Request: Polarity of setpoint S0 is OFF
P0_1↵	OK	Setup: Polarity of setpoint S0 is ON
P1_1↵	OK	Setup: Polarity of setpoint S1 is ON
P1↵	P:+00001	Request: Polarity of setpoint S1 is ON

Permitted values are 0 [OFF] and 1 [ON]

For further informations or better understanding, see the examples in chapter 10.9.5, too.

Note: All changes to the setpoint settings have to be stored in the EEPROM using the SS command.
See chapter 10.12.

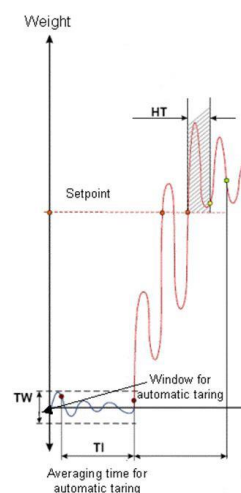
10.9.7. HT Hold time for all Setpoints [[Index 0x2408](#)]

This command defines the hold time for the setpoint limit. The signal has to exceed the setpoint limit continuously at least for this time period before a switch event will be initiated.

Note: This setup is valid for **all** 3 Logic Outputs.

Permitted value range is 0 to 65 535 ms.

Default setting: HT = 0 ms.



Master (PC / SPS) sends	Slave (WCN-H 122.1) responds	Meaning
HT↵	H+00000	Request: HT = 0 ms
HT 200↵	OK	Setup: HT = 200 ms

10.10. Communication Setup Commands – AD, NA, BR, DX, OP, CL, TD

10.10.1. AD Device Address

This command can set up the device address in the value range from 0 to 255.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
AD↵	A:000	Request: Address 0 (= factory default)
AD_49↵	OK	Setup: Address 49

Setting the device address to “0” will cause the device to be permanently active, listening and responding to every command on the bus without the need for an OP command.

Note: After editing the address you first have to save the changes (command WP) and then restart the device.

10.10.2. NA Network Address [[Index 0x300C](#)]

This command displays or sets the network address of DAD 141.1 Ethernet port.

Factory default of TCP/IP address: 192.168.0.100.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
NA↵	A:192.168.000.100	Request: Actual TCP/IP address
NA192.168.11.90↵	OK	Setup: Set the address to 192.168.11.90

Note: A change will take effect after a reset, e.g. power off / on.

10.10.3. BR Baud Rate

With this command the following baud rates can be setup: 9600, 19200, 38400, 57600 and 115200 Baud.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
BR↵	B 115200	Request: 115200 Baud (= factory default)
BR_9600↵	OK	Setup: 9600 Baud

Factory setup: 115200 baud

Note: After editing the baud rate you first have to save the changes (command WP) and then restart the device.

10.10.4. DX Operation Mode Half-/Full-Duplex

The DAD 141.1 can operate in half or full duplex mode.

Master (PC / SPS) sends	Slave (DAD 141.1) resp.	Meaning
DX↵	X:001	Request: DX = 1 (full duplex, factory default))
DX 0↵	OK	Setup: DX = 0 (half duplex)

10.10.5. OP Open Device

This command, if sent without parameters, requests the address or device number of the device active on the bus. If sent with parameters, this enables the device defined by the parameters.

Master (PC / SPS) sends	Slave (DAD 141.1) resp.	Meaning
OP↵	O:003	Request: Device #3 open
OP_14↵	OK	Setup: Open Device #14

10.10.6. CL Close Devices

This command will close DAD 141.1 device in a bus.

Master (PC / SPS) sends	Slave (DAD 141.1) resp.	Meaning
CL↵	OK	Setup: All devices closed

10.10.7. TD Transmission Delay

In some half duplex applications using a PLC system, a delay of the data transmission (up to 255 milliseconds) can be helpful due to the very quick answers of the DAD 141.1. Permitted values are 0 to 255 ms.

Master (PC / SPS) sends	Slave (DAD 141.1) resp.	Meaning
TD↵	T+00000	Request: 0 d – no delay
TD_200↵	OK	Setup: 200 d – 200 ms delay

10.11. Analog Output – AA, AH, AL, AM

The following commands must be saved in EEPROM by command AS.

10.11.1. AA Analog Output Base [[Index 0x2100](#)]

This command can setup the analog output base. Permitted values are 0 ... 8.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
AA↵	A+00001	Request: base is gross value
AA_2↵	OK	Setup: base is Peak value

You can choose one out of the following analog output base:

- 0 - analog output follows **Gross** value
- 1 - analog output follows **Net** value
- 2 - analog output follows **Peak** value (Maximum)
- 3 - analog output follows **Average** value
- 4 - analog output follows **Hold** value
- 5 - analog output follows **Peak - Peak** value
- 6 - analog output follows **Valley** value (Minimum)
- 7 - analog output follows **Display** value
- 8 - analog output is switched **OFF**

10.11.2. AH Set Analog High Level [[Index 0x2102](#)]

Request / Set up high level for analog output. Permitted values are -999 999 ... +999 999d.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
AH↵	H+010000	Request: setting 10 000 d
AH_30000↵	OK	Setup: 30 000 d

10.11.3. AL Set Analog Low Level [[Index 0x2104](#)]

Request / Setup low level for analog output. Permitted values are -999 999 ... +999 999d.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
AL↵	L+000000	Request: setting 0 d
AL_600↵	OK	Setup: 600 d

10.11.4. AM Set Analog Output Mode [[Index 0x2128](#)]

Request / Setup mode for analog output. Permitted values are 0 ... 5.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
AM↵	M:000	Request: setting 4 to 20mA
AM_3↵	OK	Setup: 0 to +10V

You can choose one out of the following analog output modes:

0	4 to 20mA
1	0 to 20mA
2	0 to +5V
3	0 to +10V
4	-5 to +5V
5	-10V to +10V

10.12. Save Calibration and Setup – CS, WP, SS, AS, GI, PI

The calibration and setup parameters can be divided in 4 groups:

- **Calibration:** CM, DS, DP, CZ, CG, ZT, IZ and FD, etc. saved by command **CS**
- **Setup:** FL, FM, NR, NT, BR, AD, DX and others, saved by command **WP**
- **Setpoints:** S1, S2, S3, H1, H2, H3, A1, A2, A3 - saved by command **SS**
- **Analog outputs:** AA, AH, AL, AM - if available - saved by command **AS**

Note: Calibration data can only be saved if the TAC code is known and preceding the CS command. See the commands **CE** and **CS** in chapter 10.2.

The setup data and the setpoint data will be stored non-volatile in the EEPROM using the **WP** respective **SS** and **AS** command.

10.12.1. CS Save the Calibration Data [[Index 0x2066](#)]

This command results in the calibration data being saved to the EEPROM and causes the TAC to be incremented by 1.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CE ↵	E+00017 (example)	Request: TAC counter CE17
CE 17 ↵	OK	Calibration sequence active
CS ↵	OK	Calibration values saved

The CS command saves all of the calibration group values, as set by AG, AZ, CZ, CG, CM, DS, DP, ZT etc. The command returns ERR and has no updating action unless it is preceded by the CE_XXXXX.

10.12.2. WP Save the Setup Parameters [[Index 0x2066](#)]

With this command the settings of the “Filter” (FL, FM), the “No-motion” (NR, NT) and the communication (AD, BR, DX) will be saved in the EEPROM.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
WP ↵	OK	Setup data saved
WP ↵	ERR	Error

10.12.3. SS Save Setpoint Parameters [[Index 0x2066](#)]

With this command the setpoints (S0, S1), the setpoint hysteresis (H0, H1) and the setpoint allocation (A0, A1) will be saved in the EEPROM.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SS ↵	OK	Setpoint parameters saved
SS ↵	ERR	Error

10.12.4. AS Save Analogue Output Parameters [[Index 0x2066](#)]

With this command the action (AA), the analog low (AL), the analog high (AH) and the output mode (AM) will be saved in the EEPROM.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
AS ↵	OK	Analog output parameters saved
AS ↵	ERR	Error

10.12.5. GI Get an Image File from the EEPROM

Retrieves a HEX-INTEL formatted EEPROM image file from the EEPROM of the source DAD 141.1. The image file contains all stored information except the calibration data. This image file can be downloaded to any DAD 141.1 with the same firmware type and revision no. as the source DAD 141.1.

10.12.6. PI Download an Image File to the EEPROM

Downloads a HEX-INTEL formatted EEPROM image file to the target DAD 141.1 EEPROM. The image file contains all stored information except the calibration data.

Attention: The target DAD 141.1 must have same firmware type and revision no. as the source DAD 141.1.

10.13. Trigger Commands – SD, MT, GA, TE, TR, TL, SA

Note: All changes to the trigger commands have to be stored in the EEPROM using the WP command. See chapter 10.12.

10.13.1. SD Start Delay Time [[Index 0x211A or 0x2412](#)]

This command defines a time delay between the trigger and the start of the measurement.

Setting range: 0 ms to 500 ms.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SD↵	S+00100	Request: SD = 100 ms
SD 200↵	OK	Setup: SD = 200 ms

Default setting: SD = 0 ms; time plot of a typical checkweigher cycle see below

10.13.2. MT Measuring Time [[Index 0x210E or 0x2410](#)]

This command defines the measuring time for the averaged measurement result.

Setting range: 0 ms to 3000 ms.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
MT↵	M+00100	Request: MT = 100 ms
MT 500↵	OK	Setup: MT = 500 ms

Note: The setting MT = 0 disables the trigger function and the averaging.

Default setting: MT = 0 [= trigger function disabled]; time plot of a typical checkweigher cycle see below

10.13.3. GA Get Triggered Average Value [[Index 0x2008 or 0x2028](#)]

This command reads the measurement result of a measurement cycle. The measurement value has been averaged according the defined measuring time.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
GA↵	A+001.100	Request: GA = 1100 g

Note: For preventing errors during the read out of the data the register GA has stored the value 99999 at the beginning of the measurement cycle. The measurement result can only be read after the defined measuring time MT has been elapsed and before a new measurement cycle has been started.

10.13.4. TE Trigger Edge [[Index 0x2402 or 0x211C](#)]

This command defines the trigger edge. Allowed settings are “0” for falling edge and “1” for rising edge. This command can only be used in conjunction with a hardware trigger on the digital input channel 0.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
TE↵	E:001	Request: TE = 1 (rising edge)
TE 0↵	OK	Setup: TE = 0 (falling edge)

Default setting: TE = 0 [= falling edge]; time plot of a typical checkweigher cycle see below

10.13.5. TR Software Trigger [[Index 0x2062](#)]

This command starts a measurement cycle. Its execution can be compared to a hardware trigger on the digital input channel 0.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
TR↵	OK	Trigger event

10.13.6. TL Trigger Level

[[Index 0x211E or 0x2400](#)]

This command defines a level for a rising edge trigger on the measurement signal. Setting range: 0 to 99999.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
TL↵	T+99999	Request: TL = 99999
TL 1000↵	OK	Setup: TL = 1000

In the example a new measurement cycle would automatically start, if the signal exceeds 1000 d (e.g. 100,0 g; trigger commands SD and TL).

Default setting: TL = 99999 [= trigger level disabled]

Note: All trigger possibilities are always available in parallel. If a software trigger (command TR) or a hardware trigger (Digital input 0) will be used the trigger level should be set to its maximum value (TL = 99999). This setting disables the trigger level.

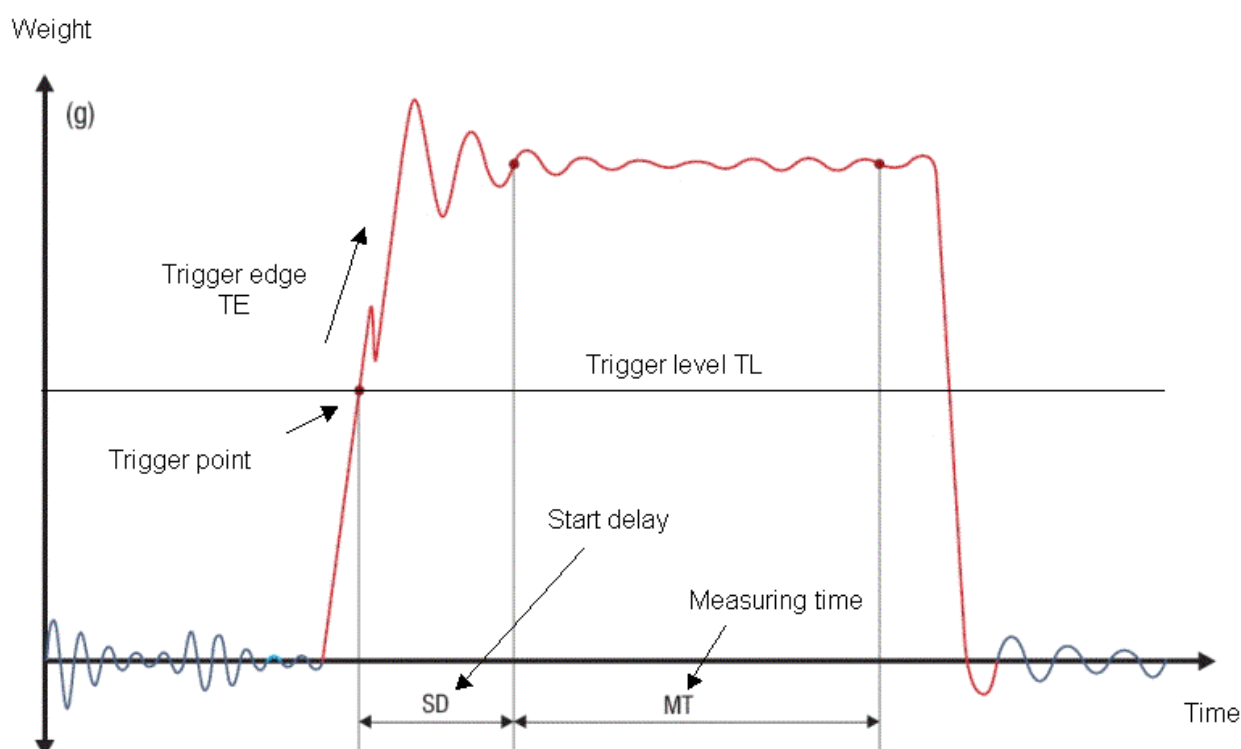


Figure: Time plot of a typical checkweigher cycle

10.13.7. SA Send Triggered Average Value automatically

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
SA↵	OK	Auto-Transmit: triggered average value

This command will start to auto-transmit the measurement value of the current trigger cycle.

11. Use in “Approved” Applications

The term “approved” applies whenever the weighing application is intended to be used for “legal-for-trade” weighing – that is, money will change hands according to the weight result. Such applications are bound by the legal metrology regulations of the relevant governments around the World, but most countries will comply with either the relevant EN’s (Euro Norms) or the relevant OIML (Organisation Internationale de Metrologie Legale) recommendations.

The DAD 141.1 is both, a complete instrument with a Type Examination Certificate in accordance with OIML R76 (for NAWI only), but in addition supplied with three Evaluation Certificates for AWI purposes, i.e. OIML R51, R61 and R107.

For NAWI, the highest performance level approved being Class III with 10 000 intervals in single range applications. The approval Authority was the Danish Electronics, Light & Acoustics (DELTA), and the approval certificate number is DK0199-R76-422. The minimum scale verification is 0.2 μ V per increment.

Due to the Type Examination Certificate (of complete instrument inclusive display, apply for NAWI only) and Verification (that the instrument comply with the Type Approval) can be stamped with the big green 'M' and some others scale features on the housing – see page 10.

This approval will allow the use in approved weighing systems throughout Europe, and in many other countries of the World. To achieve approval on a particular application, it will be necessary to satisfy the relevant Governmental Trading Standards Authority that the requirements of the various rules and regulations have been satisfied. This task is greatly simplified if the key components of the weighing system, namely the load cells and the weighing indicator or digitizer, are already approved as “components”.

Usually, a discussion with the Weighing Equipment Approvals Officers at the relevant National Weights & Measures Office will then reveal the extent of any pattern testing that may be necessary to ensure compliance.

Restrictions upon usage when in “Approved” applications

A number of performance restrictions must come into force. These restrictions are the number of display divisions, which become limited to 10000 divisions, and the sensitivity per display division, which becomes 0.25 μ V per division. Once installed in the application, an “approved” application will require “stamping” (sealing) by an Officer of the relevant Governmental Trading Standards Department. This certifies the equipment or system as being in accordance to the relevant regulations and within calibration limits.

The Traceable Access Code (TAC)

The user software must then provide a guard against improper access of the calibration commands (see the “Calibration Commands” section). The DAD 141.1 digitizer features the “Traceable Access Code” or TAC method of controlling the access to the calibration commands group. This means that a code is maintained within the device, and is incremented whenever any change to any of the calibration commands is saved. When performing the “stamping” test, the Trading Standards Officer will make a note of the TAC, and advise the user that any change to this code which occurs prior to the regular re-inspection by the Trading Standards Office, will result in legal prosecution of the user.

The user software is required as a condition of approval, to make the TAC available to the weight display indicator or console, on demand.

12. Calibration and Calibration Sequence

The calibration of DAD 141.1 is only possible after starting a calibration sequence (compare with chapter 10.2).

- Command CE: Calibration enable – returns the current TAC value
- Command CM: Calibrate maximum display – sets the max. allowable display value
- Command CI: Calibrate minimum – sets the minimum allowable display value
- Command DS: Display step size – sets the output incremental step size
- Command DP: Decimal point – sets the position of the output decimal point
- Command CZ: Calibrate zero – sets the system zero point
- Command CG: Calibrate gain – sets the system gain
- Command ZT: Zero track enable / disable
- Command ZR: If applicable: Zero Range – sets the zero range manually
- Command ZI: If applicable: Initial Zero Range
- Command FD: If applicable: Reset to factory default settings
- Command CS: Save calibration data (TAC counter automatically incremented by 1)

Preparing the calibration:

- Check, if the max value of the display is set sufficiently high (see chapter 10.2, command CM)
- Check, if the no motion conditions are defined reasonable (chapter 10.3, e.g. NR = 1, NT = 1000)
- Set the IIR filter frequency to 0.5 Hz (see chapter 10.4, FM = 0, FL = 7)

Example: Setup of zero point, system gain and decimal point

The chosen calibration weight has the value 5000 (increments). That could be 500 g, 5 kg or 5000 kg. We calibrate with 500 g. The decimal point is set up by command DPx (x = 1, 2 or 3), here 1 figure after the decimal point. A measured weight of 500 g is displayed as 500.0.

Master (PC / SPS) sends	Slave (DAD 141.1) responds	Meaning
CE↵	E+000017 (example)	Request: TAC counter CE17
Adjust zero: The scale has to be empty. No load!		
CE 17↵	OK	Calibration sequence active
CZ↵	OK	System zero point saved
Adjust gain: First put the calibration weight on the scale (here 500 g)!		
CE 17↵	OK	Calibration sequence active
CG 5000↵	OK	Setting span
CG↵	G+05000	Request: span 5000 d
CE 17↵	OK	Calibration sequence active
DP 1↵	OK	Setting: decimal point 0000.0
CE 17↵	OK	Calibration sequence active
CS↵	OK	Save calibration data in EEPROM

Zero point, gain and decimal point position were saved in the EEPROM; the calibration counter (TAC) is increased automatically by 1.