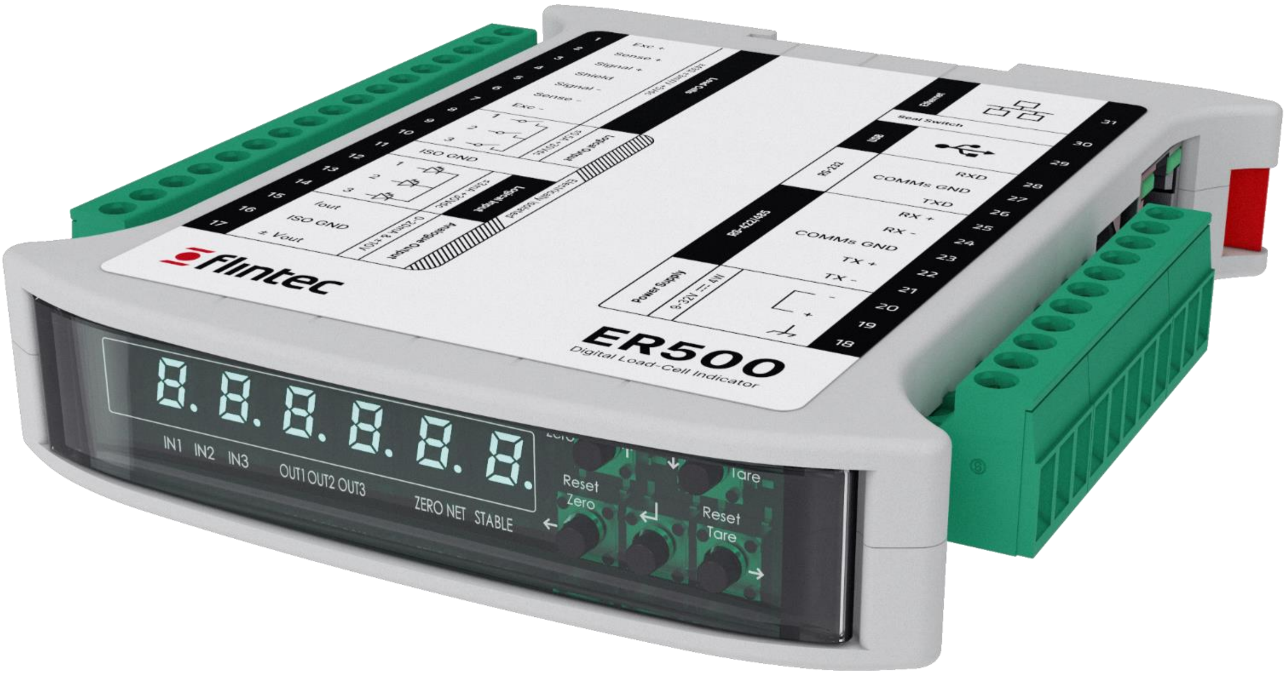
User Manual



ER500-F

v1.07 – May 2026

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1. ER500 Indicator Module

1.1. Introduction

The ER500-F is a stand-alone digital amplifier with integral 7-segment display. The weighing indicator contains a 24-bit sigma-delta analogue-to-digital converter for accurate static or dynamic weighing/filling applications. The module includes an extensive selection of standard weighing and calibration functions. It is an ideal display instrument for high-precision and high-resolution measurements applications. The ER500-F model is an approved accuracy class III module examined under OIML R61. The measurement module forms part of an approved (‘*legal-for-trade*’) weighing system. Its high-speed measuring rate and advanced filters are useful for all aspects of weighing including dynamic processes.

Communication to the module is based on ASCII characters sent to a variety of interfaces including, RS-232 or RS-485 making it easy to connect to a PC, PLC or other devices with standard serial ports. A network ethernet port and analogue outputs are also available to cover a variety of industrial situations.

The digital amplifier is a stand-alone device for 35mm DIN rail mounting (TS35). The device meets all EMC requirements according to MID 2.

Setup of the module is simple using a terminal emulation program or FDC application software (*available from Flintec.com*). The inclusion of a USB port (*standard Type-B*) is intended to make it easy to configure and make firmware upgrades. The ER500 is supported by the FDC PC application software to help the user to quickly setup, calibrate and configure the module easily.

1.2. Disclaimer

No patent liability is assumed with respect to the use of the information contained herein. While every precaution has been taken in the preparation of this book, Flintec assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein.

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NOTICE: The contents of this manual are subject to change without notice.

1.3. 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 Flintec 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.

1.4. Specification

ER500-F	Bottle Filling
Application	Automatic Weighing Instrument (AWI).
Bridge Excitation	+5V$_{DC}$.
Load-Cell/Sensor	4-Wire or 6-Wire.
Accuracy Class	Class III – Ref Class X(0.5); X(1); X(2).
Weighing Range	Single Interval, Multi-Range or Multi-Interval.
Verification Scale Interval	10,000.
Minimum Input Sensitivity	0.05μV/Count.
Certified Accuracy	0.2μV/vsi.
Resolution (External)	±600,000 counts.
Minimum Load Cell Impedance	43Ω (1x350Ω; 8x350Ω).
Maximum Load Cell Impedance	1200Ω.
Maximum Analogue Input Range	±15mV Bipolar (±3mV/V @ +5V$_{DC}$ Excitation).
Conversion Rate	2.5sps to 1200sps (Dependent on Settings)
Communication Protocols	USB CDC (Config & Setup Only).
RS-232 (8-bits, No Parity, 1-Stop-bit)	9.6k, 19.2k, 38.4k, 57.6k, 115.2k, 230.4k, & 460.8kBits/s (8-N-1).
RS-485 (Half & Full-Duplex)	9.6k, 19.2k, 38.4k, 57.6k, 115.2k, 230.4k, & 460.8kBits/s.
Power Supply	+9V$_{DC}$ to +32V$_{DC}$, <4W.
Digital Input (+32V$_{DC}$max, >10kΩ)	3 (Isolated). Vhigh +9V$_{DC}$ to +32V$_{DC}$.
Digital Output (MOSFET Relay, max +32V$_{DC}$, 500mA or 300mW)	3 (Isolated).
Digital Filtering	Selectable FIR/IIR Filters.
Calibration	Electronic Calibration in mV/V (eCal) or Test Weight(s).
Weight/Measurement Functions	Zero; Gross; Tare; Net; Filters etc.
Operating Temperature Range	-15°C to +55°C @85% RH max. Non-Condensing.
Storage Temperature	-30°C to +70°C.
Regulations/Standards	OIML R-61:2006 & EN 45501:2015.
Dimensions (L x W x D in mm)	119mm x 101mm x 22.5mm.
Weight	170g approx.
DIN Rail Mounting	IEC 60715/TS-35.
IP Protection Rating	IP20.

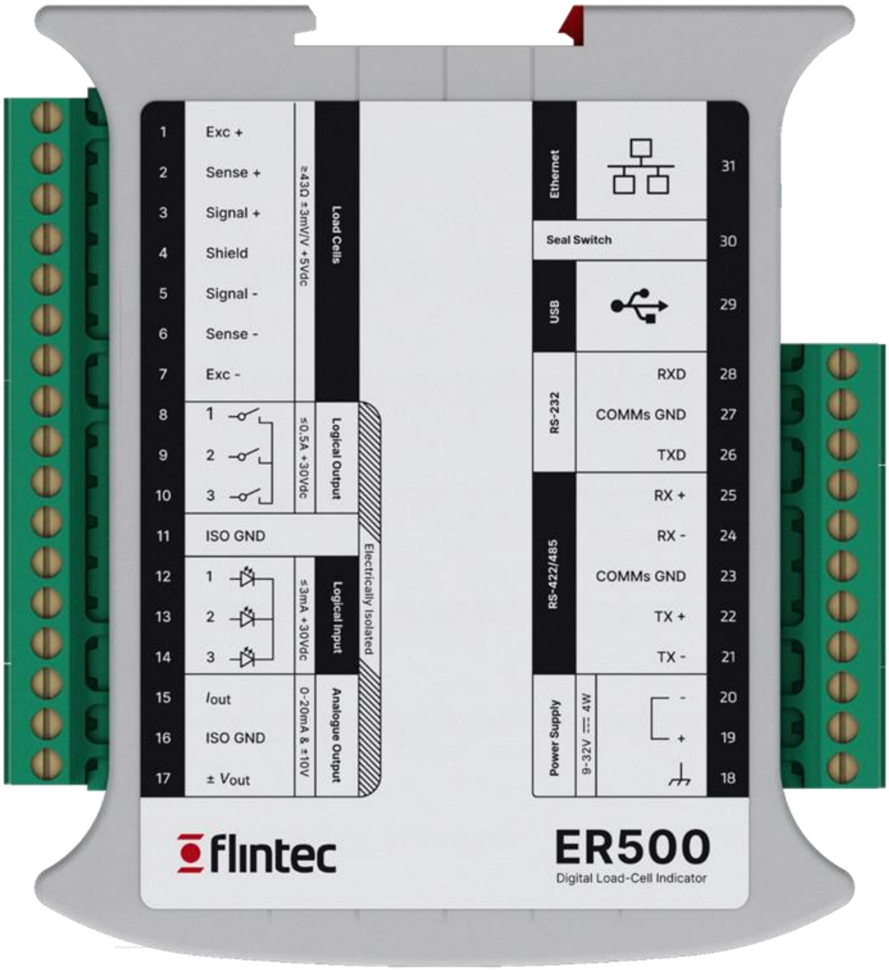
2. Getting Started

You will require:

- PC or PLC with RS-232, RS-485 or Ethernet communication ports.
- Load-cell/scale with test weights or a load-cell simulator.
- +12V_{DC} to +24V_{DC} power supply capable of delivering approximately >300mA.
- Terminal emulation software capable of handling ASCII characters e.g., Putty, TeraTerm etc. or Flintec Device Configuration (FDC) application software. Download the latest copy of FDC from the Flintec website (www.flintec.com).

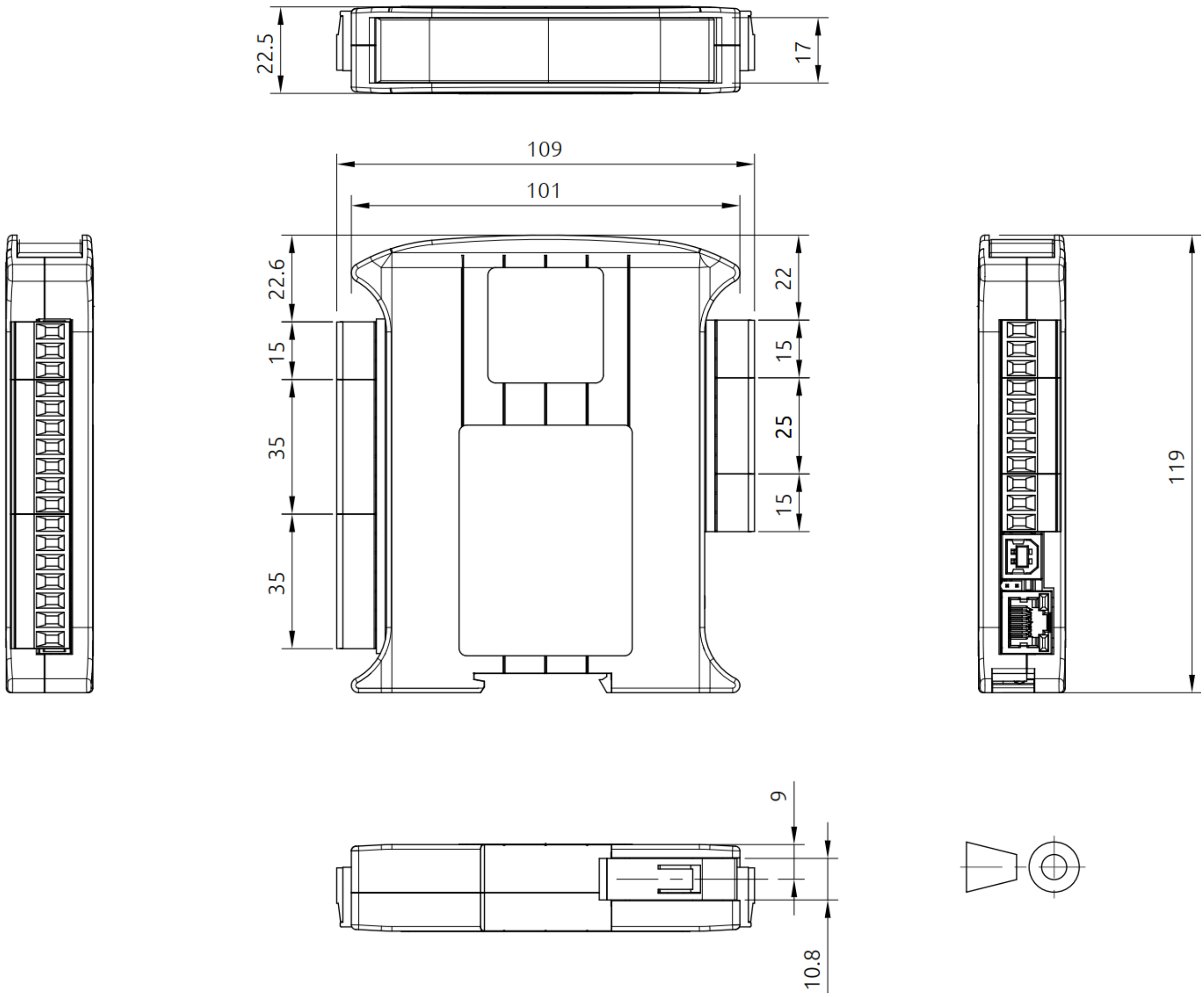
2.1. Labelling

2.1.1. Top Side Label



2.1.2. Bottom Side Labels

2.2. Dimensions



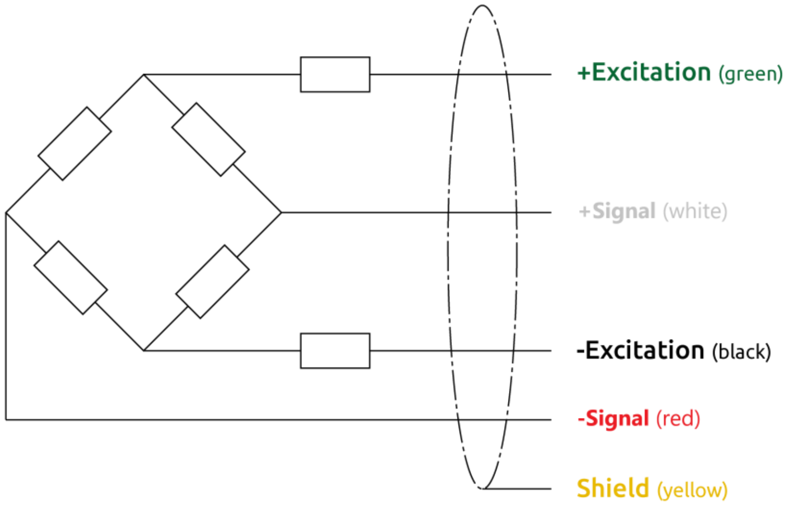
2.3. Connections

2.3.1. Load-Cell Connections

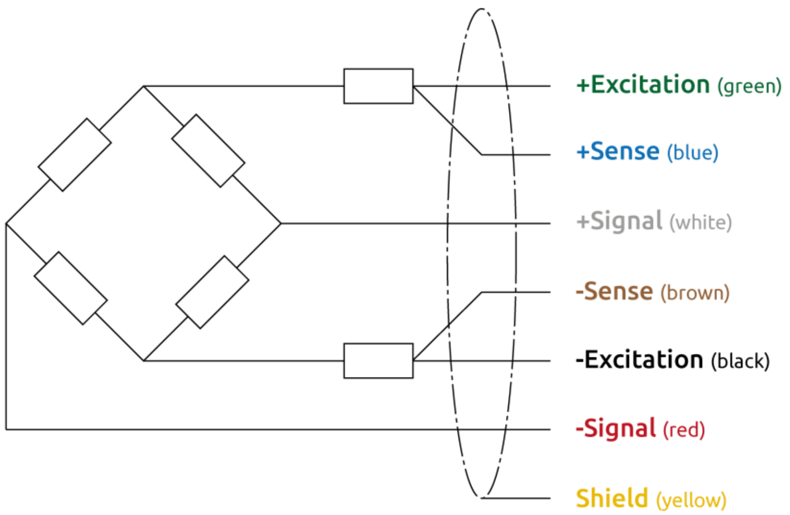
Connect the load-cell input using the reference colour coding below:

Note: If using a 4-wire configuration, tie the Excitation+ (*EXC+*) to the Sense+ & Excitation- (*EXC-*) to the Sense- for correct configuration.

4-Wire Connection:



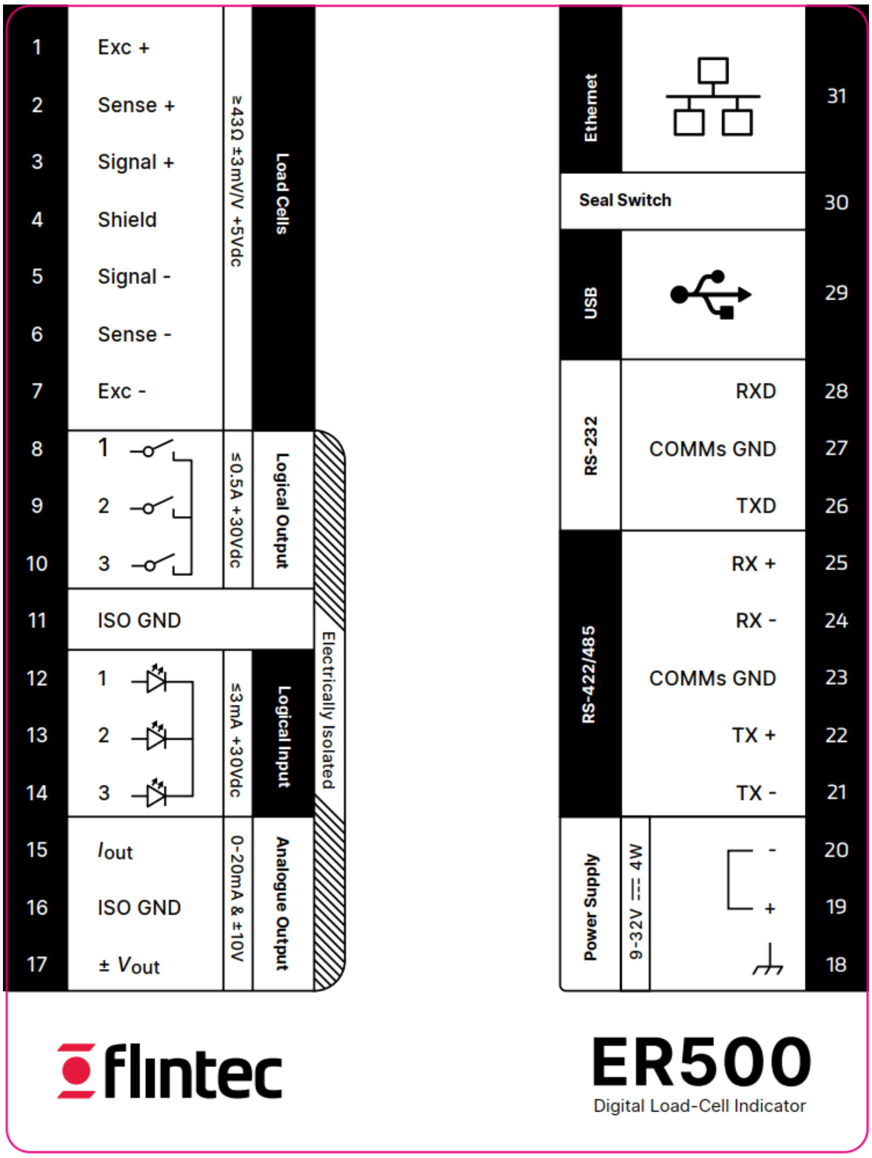
6-Wire Connection:



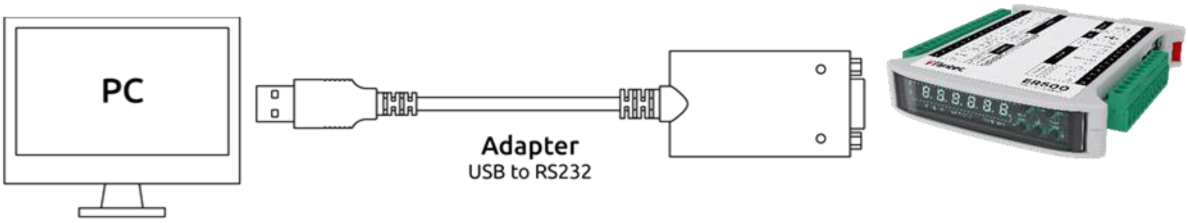
2.3.2. Power & Comms Connections

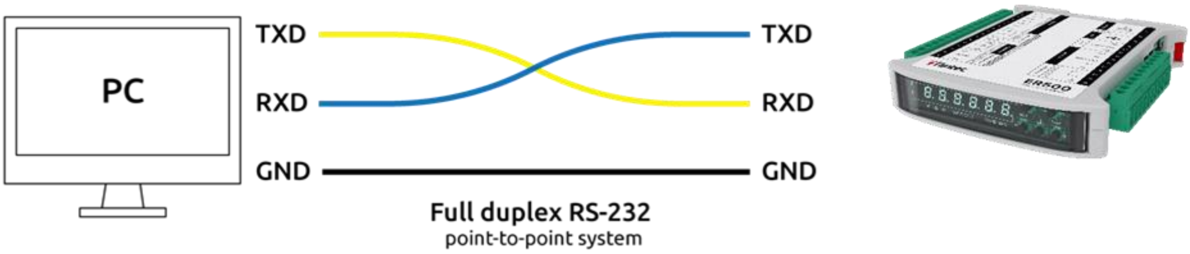
The power supply is designed to accept a +12V$_{DC}$ to +24V$_{DC}$ supply. The power supply ground is not the same potential as the comms or main chassis ground pins. Only use the appropriate power and return pins for the supply, all comms and GPIOs pins to be referenced to the associated comms or main chassis ground.

Note: The ISO_GND for the analogue outputs or the GPIOs is electrically isolated from the GNDs and should not be connected to anything other than ISO_GND.

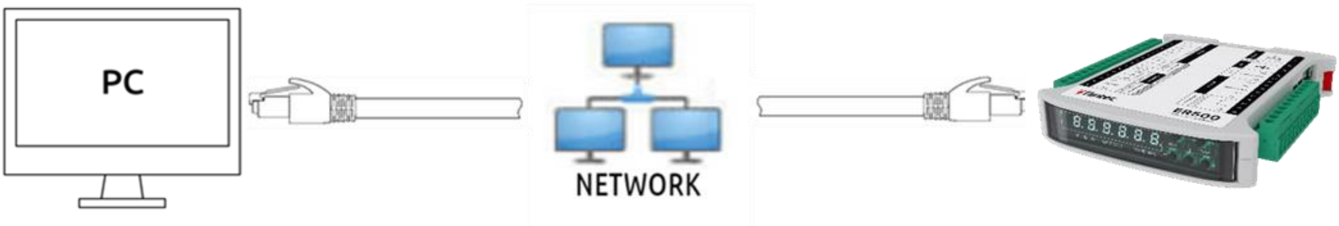


2.3.3. RS-232 Connection



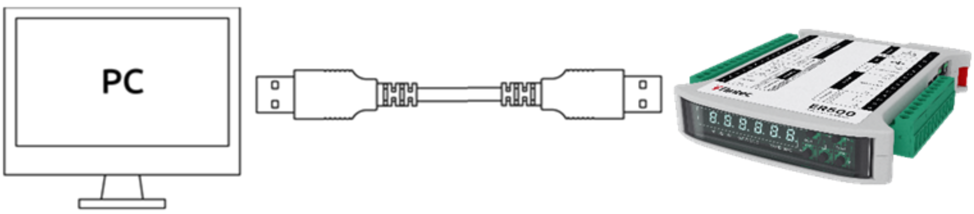


2.3.4. Ethernet Connection



Note: If using a browser to display the webserver, it may be necessary to remove leading zeros from the IP address (e.g. 192.168.001.100 → 192.168.1.100).

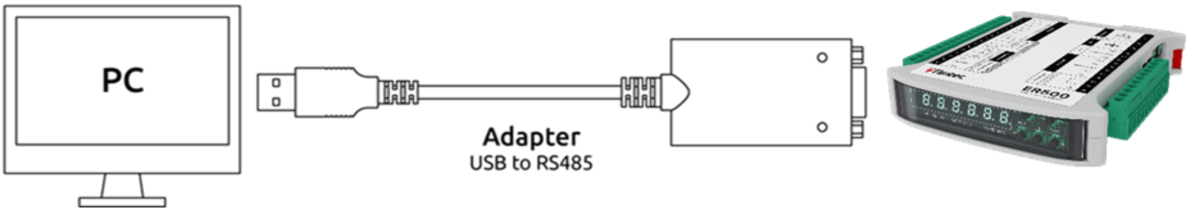
2.3.5. USB Connection



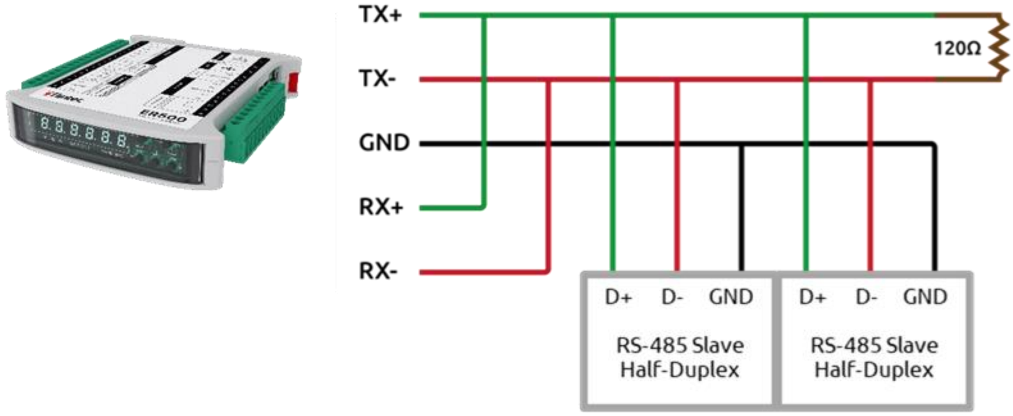
2.3.6. RS-485 Connection

Note: For '*Half-Duplex*' (RS-485) operation tie RS-485 TX+ with RS-485 RX+ and RS-485 TX- with RS-485 RX-.

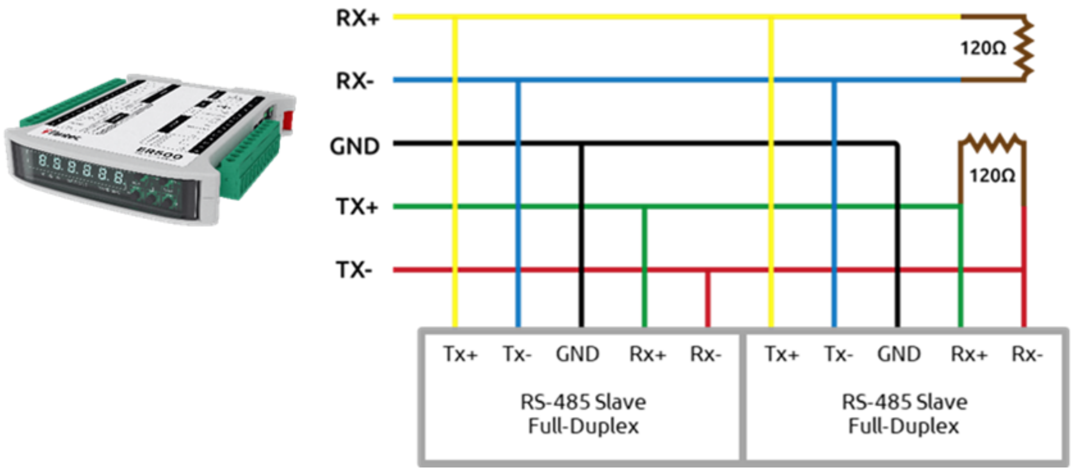
The RS-485 network requires a 120Ω termination resistor at both the host end (ER500) and at the furthest point in the network. The ER500 has a software selectable terminator built-in (see '*STR*' command).



Half-Duplex Comms



Full-Duplex Comms



2.4. Driver Check

During the first session, it may be necessary for the PC to install appropriate drivers. If using a USB-to-serial converter, consult the manufacturer for instructions and latest drivers.

If using the USB CDC connection, the STMicroelectronics driver will need to be installed. An installation manual is available from the Flintec website (www.flintec.com). Windows selects the driver automatically, however, should it be necessary to install manually, visit the ST.com website for the latest revision:

http://www.st.com/en/development-tools/stsw-stm32102.html

2.5. Navigation Buttons

Basic Navigation keys are provided to negotiate the menu structure levels.

- To enter the menu system, press the '*ENT*' button.
- Pressing ***Up*** '↑' & ***Down*** '↓' buttons simultaneously will exit the menu.
- Navigation buttons (Up '↑'/Down '↓'/Left '←'/Right '→'). The navigation buttons only apply when in menu mode, the alternative functions are described in section

2.5.1. Hot-Keys

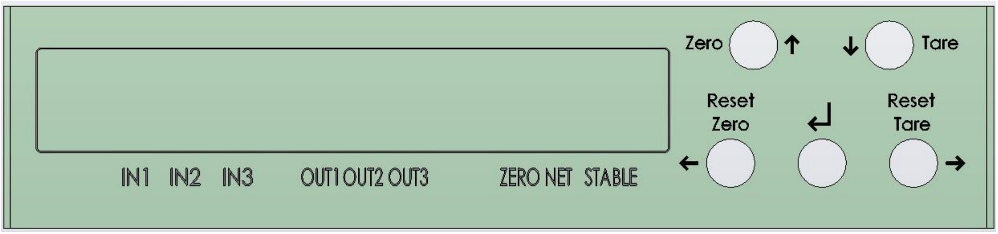
Pressing a combination of the front panel navigation buttons will engage certain functions under normal operation. Commonly used functions (e.g., *Tare* and *Zero*) are easily accessible without the need to use a command line interface.

Table of Hot-Keys:

- Zero - Press '→' and '↓' buttons, simultaneously.
- Reset Zero - Press '→' and '*ENT*' buttons, simultaneously.
- Tare - Press '→' and '↑' buttons, simultaneously.
- Reset Tare - Press '→' and '←' buttons, simultaneously.

Function	Keystrokes	Equivalent Command
Set System Zero	'*Zero*'/'↑'	'*SZ*' Command
Reset System Zero	'*Reset Zero*'/'←'	'*RZ*' Command
Set Tare	'*Set Tare*'/'↓'	'*ST*' Command
Reset Tare	'*Reset Tare*'/'→'	'*RT*' Command

2.6. LED Indicators



The front panel display has several indication LEDs.

2.6.1. Logical Inputs

The corresponding LED will be lit to indicate the status of the logical input. The LED indication is replicated in the status byte. Logic '*High*'=LED ON; Logic '*Low*'=LED OFF.

2.6.2. Logical Outputs

The corresponding LEDs will be lit to indicate the status of the logical output. The LED indication is replicated in the status byte. The control of the outputs is based on GPIO output '*OM*'/'*IO*' commands (or setpoints if used). Logic '*High*'=LED ON; Logic '*Low*'=LED OFF.

2.6.3. Zero Status

The LED (& *Centre Zero Point* status flag) is lit when the current weight input is within 0.25% of the *Display Step Size* '*DS*' setting.

2.6.4. NET LED

The LED (& *Tare Active* status flag) is used to denote to the user a valid tare has been applied. The front panel is displaying NET weight or NET mV/V measurements.

2.6.5. Stability LED

The LED (& *Stability* status flag) is used to indicate to the user the system is stable for operations such as calibration, taring & weighing. The stability window *No-Motion* commands '*NR*' and '*NT*' are the driving logic behind the *Stability* LED.

2.6.6. Negative Sign Indicator

The usual method of displaying the negative symbol is to use the middle segment of the 7-segment display. This only applies to negative values between -1 and -99,999. For negative values between -100,000 and -999,999 an additional LED indicator on the left side of the 7-segment display is only used for purpose.

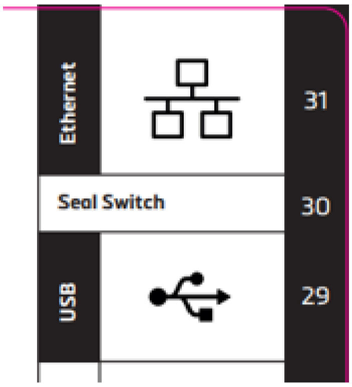
2.7. Calibration

2.7.1. Calibration Setup Commands

The calibration of ER500 is only possible after opening a calibration sequence (or remove seal switch if using front panel keys). See *chapter 5.2 '**Calibration Commands**'* for more details on the following commands.

Command **CE**:	Calibration Enable – Returns the current TAC value.
Command **CM'n'**:	Calibrate Maximum Display – Sets the max. allowable display value.
Command **CI**:	Calibrate Minimum – Sets the minimum allowable display value.
Command **CZ**:	Calibrate Zero – Sets the system zero-point.
Command **CG**:	Calibrate Gain – Sets the system gain.
Command **MR**:	Multi-Range/Multi-Interval – Selection.
Command **DS**:	Display Step Size – Sets the output incremental step size.
Command **DP**:	Decimal Point – Sets the position of the output decimal point.
Command **ZT**:	Zero Tracking – Enabled/disabled.
Command **IZ**:	If applicable: Correction of System Zero.
Command **ZR**:	If applicable: Zero Range – sets the zero range manually.
Command **ZI**:	If applicable: Initial Zero Range.
Command **ZN:**	If applicable: Set/Clear Non-Volatile Zero.
Command **TM**:	If applicable: Tare Mode (check if '*legal-for-trade*' application).
Command **TN:**	If applicable: Set/Clear Non-Volatile Tare.
Command **MTL:**	If applicable: Maximum Tare Limit.
Command **TP:**	If applicable: Set/Clear Non-Volatile Pre-Set Tare.
Command **SP:**	If applicable: Preset Tare.
Command **WT**:	If applicable: Warm-Up Time.
Command **FD**:	If applicable: Reset to factory default settings.
Command **CS**:	Save Calibration data.

2.7.2. Seal Switch for Calibration



The seal switch is provided to protect only the front panel menu system. This protection mechanism prevents any inadvertent attempts to set any of the calibration parameters via the front panel menu system.

Setup or changes of calibration settings can only be performed with an open seal switch (removing the jumper). The TAC counter will increment after each parameter is updated.

Note: If running a *legal-for-trade* application the jumper must be fitted and a tamper proof label covering the jumper applied.

2.7.3. Preparing for Calibration

- Check the *Maximum Value* is set sufficiently for the application (see '*CMn*').
- Check the *Minimum Value* is set sufficiently for the application (see '*CI*').
- Check the *Zero-Tracking* has been turned off (see '*ZT*').
- Check the *Warm-Up Time* is not set to a high value (see '*WT*').
- Check the *No-Motion* window is reasonably defined (**Default:** *NR*=1, *NT*=1000).
- Ensure the *Seal Switch* is set appropriately.
- Ensure the *Tare & Preset* Tare are set appropriately.
- Check the *Max. Tare Limit* '*MTL*' has sufficient range.
- Ensure a *calibration sequence*, '*CE*' is used before the command and terminated/saved with '*CS*' command.

2.7.4. Calibration Sequence

Example: Setup of zero-point, span and decimal point position.

The chosen calibration weight has the value 5000 (increments). That could be 500g, 5kg or 5000kg. Calibrate with 500g. The decimal point is set up by command '*DP*', for a single digit after the decimal point. A measured weight of 500g is displayed as 500.0.

Master Sends	Slave Responds With	Meaning
Read-back the next Calibration Sequence TAC Value.		
CE↵	E+000019 (example)	TAC Counter=19.
Adjust Calibration Zero: The Scale must be Empty – No Load!		
CE 19↵	OK	Calibration Sequence Active.
CZ↵	OK	System Zero-Point Obtained.
Adjust Calibration Gain: Put the Calibration Weight on Scale (here 500g).		
CE 19↵	OK	Calibration Sequence Active.
CG 5000↵	OK	Setting Span.
CG↵	G+005000	Request: Span 5000 divisions.
Setup the Decimal Point as required.		
CE 19↵	OK	Calibration Sequence Active.
DP 1↵	OK	Setting Decimal Point 00000.0.
Save the calibration sequence.		
CE 19↵	OK	Calibration Sequence Active.
CS↵	OK	Save Calibration Data.

The Zero-point, Span and Decimal Point position are saved into non-volatile memory after the *Save Calibration* sequence '*CS*' is issued. The *Traceable Calibration Counter* (TAC '*CE*') will increment. (e.g., *CE*=20).

3. Menu Structure

The initial start point of the menu structure is the root at point, position '*1.*'. Entering the menu system is enabled using the *Enter* '*ENT*' button. To Exit the menu at any point in the structure press both the *Up/Down* keys ('↑' & '↓') simultaneously to return the user back to normal operation.

Menu Navigation:

1. Entering the menu system is enabled using the '*ENT*' button.
2. Use the navigation Up '↑' and Down '↓' keys to display the entry point of the *Top-Level* menu position e.g., '*2.*'
3. Next select the '*Branch*' sub-menu with the right arrow button '→'.
4. Use the Up/Down keys ('↑' & '↓') to display the required sub-menu e.g., '*2.4*'.
5. Next select the 'Sub-*Branch*' sub-menu (if applicable) using steps 3 & 4 until the '*Leaf Node*' is reached.
6. To access the selected menu, press the '*ENT*' button.
7. To move back up to a previous level menu, use the Left '←' button.
8. To Exit the menu at any point press both the Up/Down keys ('↑' & '↓') simultaneously to return to normal operation.

Edit Mode:

There are two modes of operation, editing/selection of settings and displaying read-only information.

Editing mode (of values), the cursor will slowly flash on a digit. Cycling through using the *Up/Down* keys ('↑' & '↓') to edit the value. The digit can be changed with the *Left/Right* ('←' or '→') keys. Once the final value is correct, the *Enter* '*ENT*' key should be held until it flashes rapidly.

Editing '*Preset*' options, using the *Up/Down* keys ('↑' & '↓') will cycle through the available options. Storing the selection is via the *Enter* '*ENT*' button. The selection will show the option has been accepted by flashing rapidly.

For '*Information*' options, using the *Up/Down* keys ('↑' & '↓') will cycle through. The selection or editing is not possible as it is '*read-only*'.

1.x Zero	2.x Span	3.x Display	4.x Filter/Motion	5.x Analogue Out
1.1 Zero-Tracking	2.1 Span Calibration Value	3.1 Set Maximum 1	4.1 Filter Type FIR/IIR	5.1 Analogue Output Min.
1.2 Calibrate System Zero - Weights	2.2 System Span-Gravimetric	3.2 Set Maximum 2	4.2 Filter Cut-Off	5.2 Analogue Output Max.
1.3 Calibrate System Zero (mV/V)	2.3 System Span (mV/V)	3.3 Set Maximum 3	4.3 Update Rate	5.3 Base Output
1.4 Tare (mV/V)	2.4 Display Input (mV/V)	3.4 Set Minimum	4.4 No-Motion Range	5.4.1 Analogue Out (mA).
1.5.1 Store Tare Value	2.5 TAC Counter	3.5 Decimal Point	4.5 No-Motion Time	5.4.2 Analogue Out (V).
1.5.2 Store Zero Value		3.6 Display Step Size		5.5 Slew Rate
1.5.3 Initial Zero		3.7 Display Value Type		5.6 Slew Step Frequency
1.5.4 Zero Range		3.8 Multi-Interval		5.7 Slew Step Size
1.5.5 System Zero Correction		/Multi Range		
1.6 Tare Mode				
1.7 Gross/Net Mode				
1.8 Set/Reset Zero				

6.x Logical Inputs	7.x Logical Outputs	8.x Communications	9.x System Info	10.x Factory
6.1 Logic Input 1 Assignment	7.1.1 Setpoint 1	8.1 Communications Data Rate	9.1.1 Firmware Ver. (Main)	10.1 Restore Factory
6.2 Logic Input 2 Assignment	7.1.2 Setpoint 1 Assignment	8.2 Device Address (Serial)	9.1.2 Firmware Ver. (Disp.)	Default Settings
6.3 Logic Input 3 Assignment	7.1.3 Setpoint 1 Hysteresis	8.3 Duplex Mode	9.2 System Status	
6.4 External Input State	7.1.4 Setpoint 1 Polarity	8.4 Serial Bus Termination	9.3 Serial Number	
	7.1.5 Output 1 Test	8.5 Warm-Up Time		
	7.2.1 Setpoint 2	8.6 Transmission Delay		
	7.2.2 Setpoint 2 Assignment	8.7 DHCP		
	7.2.3 Setpoint 2 Hysteresis	8.8 Dynamic IP Address		
	7.2.4 Setpoint 2 Polarity	8.9 Static IP Address		
	7.2.5 Output 2 Test	8.10 Network Mask		
	7.3.1 Setpoint 3	8.11 Network Gateway		
	7.3.2 Setpoint 3 Assignment	8.12 Enable Modbus		
	7.3.3 Setpoint 3 Hysteresis			
	7.3.4 Setpoint 3 Polarity			
	7.3.5 Output 3 Test			
	7.4 Hold Time			

1.x Zero Setup Menu		Command	Display Format
1.1	Automatic Zero-Tracking.	ZT	nnn
1.2	Calibrate System Zero – Weights.	CZ (ZC Read-back)	nnnnnn
1.3	Calibrate System Zero (mV/V).	AZ	nnnnnn
1.4	Tare (mV/V).	TMV	tArE
	Reset Tare (mV/V).	RMV	rESEt
1.5.1	Store Tare Value (Volatile).	TN=0	oFF
	Store Tare Value (Non-Volatile).	TN=1	On
1.5.2	Store Zero Value (Volatile).	ZN=0	oFF
	Store Zero Value (Non-Volatile).	ZN=1	On
1.5.3	Initial Zero.	ZI	nnnnnn
1.5.4	Zero Range.	ZR	nnnnnn
1.5.5	System Zero Correction.	IZ	No YES
1.6	Tare Mode.	TM	n
1.7	Gross/Net Mode.	RT	9roSS
	Net Mode.	ST	nEt
1.8	Set Zero.	SZ	SEt
	Reset Zero.	RZ	rESEt

2.x Span Setup Menu		Command	Display Format
2.1	Span Calibrated Value.	GC	
2.2	System Span – Gravimetric.	CG	
2.3	System Span - mV/V Input.	AG	
2.4	Display Input Signal in mV/V.	GMV	
2.5	TAC Counter.	CE	

3.x Display Setup Menu		Command	Display Format
3.1	Set Maximum 1.	CM1	nnnnnn
3.2	Set Maximum 2.	CM2	nnnnnn
3.3	Set Maximum 3.	CM3	nnnnnn
3.4	Set Minimum.	CI	nnnnnn
3.5	Decimal Point.	DP=0	123456
		DP=1	12345.6
		DP=2	1234.56
		DP=3	123.456
		DP=4	12.3456
		DP=5	1.23456
3.6	Display Step Size.	DS=1	inc001
		DS=2	inc002
		DS=5	inc005
		DS=10	inc010
		DS=20	inc020
		DS=50	inc050
		DS=100	inc100
		DS=200	inc200
		DS=500	inc500

3.7	Display Value – 7-Segment Display OFF.	DISP=0	
	Display Value – Gross Value.	DISP=1	
	Display Value – Net Value.	DISP=2	
	Display Value – ADC Value.	DISP=3	
	Display Value – mV/V Value.	DISP=4	
3.8	Multi-Interval.	MR=0	
	Multi-Range.	MR=1	

4.x Filter & No-Motion Setup Menu		Command	Display Format
4.1	Filter Selection.	FM=0	IIr
		FM=1	FIr
4.2	Filter Cut-Off Frequencies.	FL=0	OFF OR FIr 18
	(Dependent on FM Setting).	FL=1	IIr 18 OR FIr 19
		FL=2	IIr 8 OR FIr 9.8
		FL=3	IIr 4 OR FIr 6.5
		FL=4	IIr 3 OR FIr 4.9
		FL=5	IIr 2 OR FIr 3.9
		FL=6	IIr 1 OR FIr 3.2
		FL=7	IIr 0.5 OR FIr 2.8
		FL=8	IIr0.25 OR FIr 2.5
		FL=9	IIr 10 OR OFF
		FL=10	IIr 5 OR FIr 10
		FL=11	IIr 2 OR FIr 5
		FL=12	IIr 1 OR FIr 1
		FL=13	IIr 0.5 OR IIr 0.5
		FL=14	IIr0.25 OR FIr 0.2
4.3	Update Rate.	UR	ur n
4.4	No-Motion Range.	NR	nnnnn
4.5	No-Motion Time.	NT	nnnnn

5.x Analogue Out Setup Menu		Command	Display Format
5.1	Analogue Output Minimum.	AL	nnnnnn
5.2	Analogue Output Maximum.	AH	nnnnnn
5.3	Output Assigned to Gross Value.	AP=0	9ro55
	Output Assigned to Net Value.	AP=1	nEt
	Output Assigned to Peak Value.	AP=2	PEA
	Output Assigned to Average Value.	AP=3	Au9
	Output Assigned to Hold Value.	AP=4	HoLd
	Output Assigned to Peak-to-Peak Value.	AP=5	P2P
	Output Assigned to Valley Value.	AP=6	uALLEY
	Output Assigned to Display OFF.	AP=7	d iSP
	Output Switched OFF.	AP=8	OFF
5.4.1	Analogue Current Mode.	AM=0	OFF
	0 to 20mA Current Loop.	AM=1	0_20
	4 to 20mA Current Loop.	AM=2	4_20
5.4.2	Analogue Voltage Mode OFF.	AM=0	OFF
	0 to 5V Voltage Output.	AM=16	0_5
	0 to 10V Voltage Output.	AM=32	0_10
	-5 to 5V Voltage Output.	AM=64	-5_5
	±10V Voltage Output.	AM=128	-10_10
5.5	Slew Rate.	SLEW=0	OFF
		SLEW=1	On

5.6	Slew Step Frequency.	SRC=0	258065
		SRC=1	200000
		SRC=2	153845
		SRC=3	131145
		SRC=4	115940
		SRC=5	69565
		SRC=6	37560
		SRC=7	25805
		SRC=8	20150
		SRC=9	16030
		SRC=10	10295
		SRC=11	8280
		SRC=12	6900
		SRC=13	5530
		SRC=14	4240
		SRC=15	3300
5.7	Slew Step Size.	SRS=0	1
		SRS=1	2
		SRS=2	4
		SRS=3	8
		SRS=4	16
		SRS=5	32

6.x Logical Input Setup Menu		Command	Display Format
6.1	Logical Input 1 Assignment.	AI1=0	noFunc
	Acts as a Zero button.	AI1=1	2Ero
	Acts as a Tare button.	AI1=2	tArE
	Acts as a Reset Tare button.	AI1=3	rStArE
	Start the Trigger function.	AI1=4	tri9
	Displays the Average Value.	AI1=5	Au9
	Displays the Peak Value.	AI1=6	PEA
	Deletes the Peak Value.	AI1=7	dELPEA
	Displays the Peak Hold Value.	AI1=8	HoLd
	Displays the Peak-to- Peak Value.	AI1=9	P2P
	Displays the Valley Value.	AI1=10	uALLEY
	Disables front panel buttons.	AI1=11	diSbut
	Stores Input 'n' Hold Value.	AI1=12	StorE
	Tares display and delete all other values.	AI1=13	tArE
	Turns off the display.	AI1=14	diSoFF
6.2	Same as above.	AI2	
6.3	Same as above.	AI3	
6.4	External Input Status.	IN	nnn

7.x Logical Output Setup Menu		Command	Display Format
7.1.1	Set-Point 1 Value.	S1	nnnnnn
7.1.2	Set-Point 1 Assignment - Gross.	A1=0	9ro55
	Assignment - Net.	A1=1	nEt
	Assignment - Peak.	A1=2	PEA
	Assignment - Average.	A1=3	Au9
	Assignment - Hold.	A1=4	HoLd
	Assignment – Peak-to- Peak.	A1=5	P2P
	Assignment - Valley.	A1=6	uALLEY
7.1.3	Set-Point 1 Hysteresis.	H1	nnnnnn
7.1.4	Set-Point 1 Polarity.	P1=0	nE9
		P1=1	Po5
7.1.5	Output 1 Test Mode.	IO=0	OFF
		IO-1	On
7.2	As Set-Point 1.		
7.3	As Set-Point 1.		
7.4	Hold Time for Set-Points.	HT	nnnnnn

8.x Communications Setup Menu		Command	Display Format
8.1	Communications Data Rate.	BR=9600	9600
		BR=19200	19200
		BR=38400	38400
		BR=57600	57600
		BR=115200	115200
		BR=230400	230400
		BR=460800	460800
8.2	Device Address (Serial).	AD	nnn
8.3	Duplex Mode.	DX=0	HALF
		DX=1	FULL
8.4	RS-485 Serial Bus Termination.	STR=0	OFF
		STR=1	On
8.5	Warm-Up Time.	WT	nnnnnn
8.6	Transmission Delay.	TD	nnn
8.7	DHCP.	DH=0	dhcP 0
		DH=1	dhcP 1
8.8	Dynamic IP Address.	DA AAA:BBB:CCC:DDD	
8.8.1		xxx:BBB:CCC:DDD	nnn
8.8.2		AAA:xxx:CCC:DDD	nnn
8.8.3		AAA:BBB:xxx:DDD	nnn

8.8.4		AAA:BBB:CCC:xxx	nnn
8.9	Static IP Address.	NA AAA:BBB:CCC:DDD	
8.9.1		xxx:BBB:CCC:DDD	nnn
8.9.2		AAA:xxx:CCC:DDD	nnn
8.9.3		AAA:BBB:xxx:DDD	nnn
8.9.4		AAA:BBB:CCC:xxx	nnn
8.10	Network Mask.	NM AAA:BBB:CCC:DDD	
8.10.1		xxx:BBB:CCC:DDD	nnn
8.10.2		AAA:xxx:CCC:DDD	nnn
8.10.3		AAA:BBB:xxx:DDD	nnn
8.10.4		AAA:BBB:CCC:xxx	nnn
8.11	Network Gateway.	NG AAA:BBB:CCC:DDD	
8.11.1		xxx:BBB:CCC:DDD	nnn
8.11.2		AAA:xxx:CCC:DDD	nnn
8.11.3		AAA:BBB:xxx:DDD	nnn
8.11.4		AAA:BBB:CCC:xxx	nnn
8.12	Modbus OFF.	MOD=0	OFF
	Modbus ASCII.	MOD=1	ASCII
	Modbus RTU.	MOD=2	rtU

9.x Info Setup Menu		Command	Display Format
9.1.1	Firmware Version (Main).	FFV	nn.nn.nn
9.1.2	Firmware Version (Display).	FFD	nn.nn.nn
9.2	Device Status.	IS	nnn.nnn
9.3	Serial Number.	RS	nnnnnn

10.x Factory Default Setup Menu		Command	Display Format
10.1	Factory Default.	FD=0	nonE
		FD=1	rESEt

4. Commands Overview

Command	Factory Default	Parameter Range	Description
A'n'	1 dec.	0…7 dec.	Allocation Source for a Set-Point.
AC	No Default.	N/A.	Abort Filling Cycle.
AD	Zero.	0…254 dec.	Set Device Address (0=perm active).
AG	10000 dec.	±33000 dec.	Absolute Gain Calibration (mV/V).
AH	10000 dec.	±999999 dec.	Analogue Output Higher Limit.
AI'n'	Zero.	0…14 dec.	Logical Input Assignment.
AL	Zero.	±999999 dec.	Analogue Output Lower Limit.
AM	Zero.	0…130 dec.	Analogue Output Mode.
AP	1 dec.	0…8 dec.	Analogue Output Assignment
AS	No Default.	N/A.	Save Analogue Output Parameter Values to Non-Volatile Memory.
AZ	Zero.	±33000 dec.	Absolute Zero-Point Calibration (mV/V).
BR	9600 dec.	9600…460800 dec.	Baud-Rate.
CE	No Default.	0…65534 dec.	Open Calibration Sequence. Read TAC Counter.
CG	10000 dec.	1…999999 dec.	Set Calibration Gain (Span) at Load > Zero.
CI	-999999 dec..	-999999…0 dec.	Minimum Output Value.
CL	No Default.	N/A.	Close Device Communication.
CM1	999999 dec.	1…999999 dec.	Set Maximum Output Value (n=1).
CM2	Zero.	0…999999 dec.	Set Maximum Output Value (n=2).
CM3	Zero.	0…999999 dec.	Set Maximum Output Value (n=3).
CRCLR	No Default.	N/A.	1st – Main Board FW Checksum. 2nd – Display Board FW Checksum
CS	No Default.	N/A.	Save Calibration Data.
CZ	No Default.	N/A.	Set Calibration Zero Point (No-Load).
DA	192.168.1.100 dec.	N/A.	Current Network IP Address (Read-Only).
DH	Zero.	0…1 dec.	DHCP Allocation.
DI	No Default.	N/A.	Filling Status (2-byte).
DISP	1 dec.	0…4 dec.	Front Panel Display Value.
DP	3 dec.	0…6 dec.	Set Decimal Point Position.
DS	1 dec.	1, 2, 5, 10, 20, 50, 100, 200, 500 dec.	Set Display Step Size.
DT	No Default.	0…65535 dec.	Get Last Tare Weight.
DX	Zero.	0…1 dec.	Set Duplex Mode.
FD	No Default.	N/A.	Restore Factory Default Settings.

FFD	No Default.	N/A.	Flintec Display Firmware Version.
FFV	No Default.	N/A.	Flintec Firmware Version.
FL	3 dec.	0...14 dec.	Filter Cut-Off Frequency.
FM	Zero.	0...1 dec.	Filter Mode.
FPN	No Default.	N/A.	Get Device ID.
GA	No Default.	N/A.	Get Triggered Average Value.
GC	No Default.	N/A.	Readback of Calibration Span.
GD	No Default.	N/A.	Get Last Dosed Weight.
GG	No Default.	N/A.	Get Gross Value.
GH	No Default.	N/A	Get Hold Weight Value.
GL	No Default.	N/A.	Get Data String (Average, Gross, Status).
GM	No Default.	N/A.	Get Peak Value.
GMV	No Default.	N/A.	Get mV/V Value.
GN	No Default.	N/A.	Get Net Value.
GO	No Default.	N/A.	Get Peak-to-Peak Value.
GS	No Default.	N/A.	Get ADC Sample Value.
GRS	No Default.	N/A.	Get RAW ADC Sample
GT	No Default.	N/A.	Get Tare Value.
GV	No Default.	N/A.	Get Valley Value.
GW	No Default.	N/A.	Get Data String (Net, Gross, Status).
H'n'	Zero.	±999999 dec.	Hysteresis Set-points.
HT	Zero.	0...65535 dec.	Hold-Time for All Set-points (ms).
HW	No Default.	N/A.	Hold Weight - Broadcast Message.
IN	No Default.	0000...0111 bin.	External Input State.
IO	Zero.	0000...0111 bin.	External Output State.
IS	No Default.	N/A.	Get System Status.
IZ	No Default.	N/A.	Correction of System Zero.
MA	04-C3-E6-Bx-xx-xx	N/A.	MAC ID Address (Unique).
MOD	Zero.	0...3 dec.	Modbus Configuration.
MR	Zero.	0...1 dec.	Set Multi-Range/Multi-Interval.
MT	Zero.	0...3000 dec.	Measuring Time for Averaging (ms).
MTL	Zero.	0...999999 dec.	Maximum Tare Limit.
NA	192.168.1.100 dec.	0...255 dec.	Static Network IP Address.
NG	192.168.1.1 dec.	0...255 dec.	Default Gateway Address.
NM	255.255.255.0 dec.	0...FF hex.	Network Mask.
NR	1 dec.	1...65535 dec.	No-Motion Range.
NT	1000 dec.	1...65535 dec.	No-Motion Time-Period (ms).
OF	Zero.	0...3 dec.	Output Format of Data String GL & GW.
OM	Zero.	0000...0111 bin.	External Output Mask.
OP	Zero.	0...254 dec.	Open Communications.

P'n'	1 dec.	0…1 dec.	Polarity of Set-Point.
PD1	Zero.	0, 1, 2, 3, 4, 8, 12 dec.	Pre-Fill Mode.
PD2	Zero.	0…50 dec.	In-Flight Correction Value.
PD3	Zero.	0…65535 dec.	Average Time Zero Check Load Cell.
PD4	Zero.	0…65535 dec.	Delay Time Tare Average Value.
PD5	Zero.	0…65535 dec.	Average Time Tare Weight Value.
PD6	Zero.	0…65535 dec.	Delay Time After Pre-Filling Value.
PD7	Zero.	0…65535 dec.	Blanking Time After Coarse Valve Shuts Off.
PD8	Zero.	0…65535 dec.	In-Flight Delay Time After Fine Valve Shuts Off.
PD9	Zero.	0…65535 dec.	Dosed Weight Average Time.
PD10	Zero.	0…999999 dec.	Zero Tolerance Value.
PD11	Zero.	0…999999 dec.	Tare Reference Weight Value.
PD12	Zero.	0…999999 dec.	Tare Weight Tolerance Value.
PD13	Zero.	0…999999 dec.	Pre-Fill Level 1st Setpoint Value.
PD14	Zero.	0…999999 dec.	Fine-Fill Weight Value.
PD15	Zero.	0…999999 dec.	Filling Weight Value.
PD16	Zero.	0…999999 dec.	In-Flight Weight Value.
PD17	Zero.	0…999999 dec.	Pre-Fill Level 2nd Setpoint Value.
PD18	Zero.	0…65535 dec.	Filling Timeout Value.
PD19	Zero.	0…65535 dec.	Underweight Post-Fill Time Value.
PD20	1 dec.	0…999999 dec.	Tare Interval Value.
PD21	Zero.	0…65535 dec.	Bag Rupture Blanking Value.
RM	No Default.	N/A	Reset Peak Value.
RMV	No Default.	N/A.	Reset Tare to mV/V.
RS	No Default.	N/A	Read Serial Number.
RT	No Default.	N/A	Reset Tare.
RZ	No Default.	None	Reset Zero Point.
S'n'	999999 dec.	±999999 dec.	Set-Point Setups.
SA	No Default.	N/A	Stream Triggered Average Value.
SC	No Default.	N/A	Start Filling Cycle.
SD	Zero.	0…65535 dec.	Start Delay.
SDD	No Default.	N/A	Save Bottling/Dosing Parameter Values to Non-Volatile Memory.
SG	No Default.	N/A	Stream Gross Value.
SL	No Default.	N/A	Stream Data String (Average, Gross, Status).
SLEW	Zero.	0…1 dec.	DAC Slew Rate ON/OFF.
SMV	No Default.	N/A.	Stream mV/V Value.
SN	No Default.	N/A	Stream Net Value.
SO	No Default.	N/A	Stream Peak-to-Peak Value.
SP	Zero.	0…999999 dec.	Preset Tare Value.

SR	No Default.	N/A	Software Reset.
SRC	Zero.	0…15 dec.	DAC Slew Rate Filter Cut-Off.
SRS	Zero.	0…7 dec.	DAC Slew Rate Step Size.
SS	No Default.	N/A.	Save Set-point Parameter Values to Non-Volatile Memory.
ST	No Default.	N/A.	Set Tare Value.
STR	1 dec.	0…1 dec.	RS-485 Termination Resistor Select.
SV	No Default.	N/A.	Stream Valley Value.
SW	No Default.	N/A.	Stream Data String (Net, Gross, Status).
SX	No Default.	N/A.	Stream ADC Sample.
SZ	No Default.	N/A.	System Zero Value.
TD	20 dec.	0…255 dec.	Transmit Delay (ms).
TE	1 dec.	0…1 dec.	Trigger Edge.
TH	No Default.	N/A.	Trigger Hold Value.
TL	999999 dec.	0…999999 dec.	Trigger Level Value.
TM	Zero.	0…3 dec.	Tare Mode.
TMV	No Default.	N/A.	Apply Tare to mV/V.
TN	Zero.	0…1 dec.	Set/Clear Non-Volatile Tare.
TP	Zero.	0…1 dec.	Set/Clear Non-Volatile Preset Tare.
TR	No Default.	None.	Software Trigger.
UR	Zero.	0…7 dec.	Output Averaging Update Rate.
WP	No Default.	N/A.	Save Setup Data to Non-Volatile Memory.
WT	Zero.	0…65535 dec.	Warm-Up Time (secs).
ZC	No Default.	N/A.	Readback of Zero Calibration Point.
ZI	Zero.	0…999999 dec.	Initial Zero Range.
ZN	Zero.	0…1 dec.	Set/Clear Non-Volatile Zero.
ZR	Zero.	0…999999 dec.	Manually Set Zero Range.
ZT	Zero.	0…255 dec.	Enable/Disable Zero Tracking.

5. Command Descriptions

5.1. System Diagnostic Commands – FPN, FFD, FFV, CRCLR, SR, RS, IS, DISP

Use these commands to interrogate the ER500 for system information. These commands are read-only and sent without parameters (except '*DISP*').

5.1.1. FPN Get Device Model

The response to this request gives the model identity. This is particularly useful when identifying different model types on the same bus. This is a read-only register.

Master Sends	Slave Responds With
FPN↵	P:ER500-G.

Factory Default: None.

5.1.2. FFD Get Firmware Version – Display Board

The Flintec firmware version for the display board is in the format vXX.YY.ZZ.

XX is the legally relevant revision.
YY is the major non-legally relevant revision.
ZZ is the minor non-legally relevant revision.

Master Sends	Slave Responds With
FFD↵	D:2.0.0 (example).

Factory Default: None.

5.1.3. FFV Get Firmware Version – Main Board

The Flintec firmware version for the main board is in the format vXX.YY.ZZ.

XX is the legally relevant revision.
YY is the major non-legally relevant revision.
ZZ is the minor non-legally relevant revision.

Master Sends	Slave Responds With
FFV↵	V:3.1.0 (example).

Factory Default: None.

5.1.4. CRCLR Get Firmware Version Checksums

This command has no parameters and is used to request the Flintec Firmware Version Legally Relevant '*CRCLR*' checksums (in Hex.). The first sequence is the Main board FW checksum and second is the Display board FW checksum.

Master Sends	Slave Responds With
CRCLR↵	CRCLR:0x56D72F36, 0xC4569485 (example).

Factory Default: None.

5.1.5. SR Software Reset

This command has no parameters and is used to reset the system. After receiving the command, the system will respond with '*OK*' during the current session, then the reset sequence will start.

The *Software Reset* '*SR*' has the same functionality as a manual power cycle (ON → OFF → ON). Any calibration, setup or user settings must be preserved using the appropriate save commands prior to the reset (*see section 5.11*).

Master Sends	Slave Responds With
SR↵	OK

Factory Default: None.

5.1.6. RS Read Serial Number

Issuing the *Software Reset* '*RS*' command will return the serial number in the format S+12345678. This is a read-only register.

Master Sends	Slave Responds With	Meaning
RS↵	S+12345678	**Request:** SN=12345678.

Factory Default: None.

5.1.7. IS Get Device Status

The get *Device Status* '*IS*' command is a read-only request to get the latest system status value. The *System Status* '*IS*' value comprises of two 3-digit decimal values (129 and 003), which can be decoded according to the table below:

3-digit Value – Left	3-digit Value – Right
1 Signal Stable (*No-Motion*).	1 Input 1.
2 Zeroing Action Performed.	2 Input 2.
4 Tare Active.	4 Input 3.
8 Warm-Up Time Active.	8 (Not Used).
16 Centre Zero.	16 (Not Used).
32 Output 1 Active.	32 (Not Used).
64 Output 2 Active.	64 (Not Used).
128 Output 3 Active.	128 (Not Used).

Centre Zero – Indicates zero point (within 25% of *Display Step Size* '*DS*').

Zero Action Performed – Indicates a *Set System Zero* '*SZ*' event.

Warm-Up Time – Indicates the restriction of gross and net values for time-period '*WT*'.

Signal Stable – Indicates the No-Motion window '*NR*' & '*NT*' is valid.

Tare Active – Indicates a Tare '*ST*' and/or Preset Tare '*SP*' set (not *mV/V Tare* '*TMV*').

Inputs – Indicates an input detection of the GPIO Input.

Outputs – Indicates the GPIO output port state dependent upon setpoint or IO setting.

The example decodes the result **S:129004** as follows:

- Input 3 Active [=4].
- Signal Stable [=1].
- Output 3 Active [=128].

Master Sends	Slave Responds With
IS↵	S:129004 (example).

Note: The status flags are also available from *Menu 9.2* and the External Input status from *Menu 6.4*. The '*Active Tare*' only applies to the Gross and not *mV/V Tare* '*TMV*'.

Factory Default: None.

5.1.8. DISP Front Panel Display Value

The *Display Status* '*DISP*' command is stored in non-volatile memory using the *Save Setup Parameter* '*WP*' command. The following options are available for the front panel display. Enter the decimal value using the '*DISP*' command (or via ***Menu 3.7***).

- 0 – Display OFF (LEDs active).
- 1 – Display Gross.
- 2 – Display Net Value.
- 3 – Display ADC Sample Value.
- 4 – Display mV/V Value.

To display the mV/V value on the front panel without affecting the current session by update of the '*DISP*' setting (***Menu 2.4***). Exiting the mV/V display mode is via a reset or pressing the '↑' & '↓' buttons, simultaneously. The display returns to the last '*DISP*' value stored in non-volatile memory.

Note: During a power cycle or *Software Reset* '*SR*', if the display value *DISP*=0 (display OFF), the ER500 will power up with the Gross value displayed instead of a blank screen. The value of DISP will be updated to Gross in non-volatile memory too.

During power-up with *Warm-Up Time* '*WT*' enabled, the Gross/Net (DISP=1 & DISP=2) will not display until the WT counter has elapsed. The ADC (DISP=3) and mV/V (DISP=4) options will be displayed.

Master Sends	Slave Responds With	Meaning
DISP↵	D:001	**Request:** Display Value is Gross.
DISP 2↵	OK	**Setup:** Set display to Net Value.

Permitted Values: 0…4.

Factory Default: 1 [Display Value is Gross].

5.2. Calibration Commands – CE, CM'n', CI, CZ, CG, ZC, ZG, AZ, AG, MR, DS, DP, ZT, IZ, ZR, ZI, ZN, TM, TN, MTL, TP, WT, FD

Note: All changes to the calibration commands must be stored in non-volatile memory using the '*CS*' command.

5.2.1. CE Enable Calibration Sequence/Read TAC Counter

The enable/open calibration sequence (Traceable Access Code) command must be issued **PRIOR** to any attempt to set the parameters in the calibration group of commands. In '*legal-for-trade*' applications the TAC counter can be used without parameter to check if critical parameters have been changed without re-validation. After each calibration save '*CS*' the TAC counter will increment.

Master Sends	Slave Responds With	Meaning
CE↵	E+000011 (example)	**Request:** TAC Counter=11.
CE 11↵	OK	Calibration Sequence Active.

Factory Default: None.

5.2.2. CM'n' Set Maximum Output Value

The '*CM*' command with n=1, 2 or 3 is used to set up the maximum output values (respective switching point in multi-range applications). This value will determine the point at which the output will change to '*oooooooo*', signifying '*over-range*' condition.

Master Sends	Slave Responds With	Meaning
CM1↵	M+030000	**Request:** CM1=30000dec.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
CM1 50000↵	OK	**Setup:** CM1=50000dec.

Application	CM1=Max1	CM2=Max2	CM3=Max3
Single Range	CM1=1...999999.	CM2=0 (means CM2 Not used).	CM3=0 (means CM3 Not used).
Dual Range or Dual Interval	CM1=1...Max1.	CM2=Max1...999999.	CM3=0 (means CM3 Not used).
Triple Range or Triple Interval	CM1=1...Max1.	CM2=Max1...Max2.	CM3=Max2...999999.

It is necessary: 1 ≤ Max1 < Max2 < Max3 ≤ 999999.

Note: The range in which a scale can be set to zero '*SZ*' or automatic *Zero-Tracking* '*ZT*' is active, is ±2% of *CM'n'* value.

Permitted Values: 0...999999.

Factory Default: *CM1*=999999, *CM2*=0, *CM3*=0.

5.2.3. CI Set Minimum Output Value

This command is used to set up the minimum output value. This value will determine the point at which the output will change to '*uuuuuuu*', signifying '*under-range*' condition.

Master Sends	Slave Responds With	Meaning
CI↵	I-000009	**Request:** CI=-9dec.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE11↵	OK	Calibration Sequence Active.
CI -10000↵	OK	**Setup:** CI=-10000dec.

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

Permitted Values: –999999...0.

Factory Default: –999999.

5.2.4. CZ Set Calibration Zero Point

This is the reference point for all weight calculations and is subject to TAC control. The calibration zero point is a write-only command and cannot be used to read back the calibration values.

Master Sends	Slave Responds With	Meaning
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
CZ↵	OK	**Setup:** Zero Point.

Factory Default: Approx. 0mV/V input signal (set in the factory).

5.2.5. CG Set Calibration Gain (Span)

This is the reference point for calibration under load and is subject to TAC control. The calibration span point is a write-only command and cannot be used to read back the calibration values.

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. If the calibration weight smaller than 1% of Display Maximum '*CM*', the ER500 will respond with an error message '*ERR*'.

Master Sends	Slave Responds With	Meaning
CG↵	G+010000	**Request:** Calibration Weight=10000dec.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
CG 15000↵	OK	**Setup:** Calibration Weight=15000dec.

Permitted Values: 1…999999.

Factory Default: 10,000 [10,000=2.000mV/V Input Signal].

5.2.6. ZC Calibration Zero Point Readback

Read-only access to the stored calibration value is via the *Read Calibration Zero* '***ZC***' command in ADC counts.

Factory Default: None.

5.2.7. GC Calibration Span Point Readback

Read-only access to the stored calibration value is via the *Read Calibration Span* '***GC***' command in ADC counts.

Factory Default: None.

5.2.8. AZ Absolute Zero Point Calibration (eCal)

The '***AZ***' command is used as a reference for weight calculations and is setup in mV/V.

Master Sends	Slave Responds With	Meaning
AZ↲	Z+000796	**Request:** Zero Point @ 0.0796mV/V.
CE↲	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↲	OK	Calibration Sequence Active.
AZ 00500↲	OK	**Setup:** Zero Point @ 0.0500mV/V.

Permitted Values: ±33000 (±3.3000mV/V).

Factory Default: 000000dec. @ 0.0000mV/V input signal.

5.2.9. AG Absolute Gain Calibration (eCal)

The '***AG***' command is used as absolute gain (or measuring range) for all weight calculations setup in mV/V.

Master Sends	Slave Responds With	Meaning
AG↲	G+001868+010000	**Request:** AG Status.
CE↲	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↲	OK	Calibration Sequence Active.
AG 11200 5000↲	OK	**Setup:** Gain 5000dec. @ 1.12mV/V.

Permitted Values: ±33000 (±3.3000mV/V).

Factory Default: 10,000d @ 2.0000mV/V input signal.

5.2.10. MR Set Multi-Interval/Multi-Range

This command is applicable if either *CM2* > 0 or *CM2* > 0 & *CM3* > 0.

Note: Single range applications ignore this parameter.

Master Sends	Slave Responds With	Meaning
MR↵	M:000000	**Request:** Multi-Interval.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
MR 1↵	OK	**Setup:** MR=1 (Multi-Range).

Permitted Values: 0 (Multi-Interval) or 1 (Multi-Range).

Factory Default: 0 [Multi-Interval].

5.2.11. DS Set Display Step Size

This command allows the output to step up or down by a unit other than 1. '*Legal-for-Trade*' applications allow for up to 10,000 intervals. The allowed step size must be considered.

Master Sends	Slave Responds With	Meaning
DS↵	S+000000	**Request:** Step Size 1.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
DS 50↵	OK	**Setup:** Step Size=50.

Permitted Values: 1, 2, 5, 10, 20, 50, 100, 200 and 500.

Factory Default: 1.

5.2.12. DP Set Decimal Point Position

This command allows the decimal point to be positioned anywhere in the displayed value. Setting a value of 5 will insert a decimal point five positions from the right side of the 6-digit output result.

Master Sends	Slave Responds With	Meaning
DP↵	P+000000	**Request:** No Decimal Point. DP=0.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
DP 5↵	OK	**Setup:** Displayed value **1.23456**

Permitted Values: 0…5.

Factory Default: 3.

5.2.13. ZT Enable/Disable Zero-Tracking

This command enables or disables the zero-tracking. *ZT*=0 disables the zero-tracking and *ZT*=1 or higher enables the zero-tracking. Issuing the command without any parameter returns the current '*ZT*' value. The zero-tracking will fail (responding with ERR) if the *Auto-Zero Enable* '*AZE*' function is set.

Master Sends	Slave Responds With	Meaning
ZT↵	Z:001	**Request:** ZT Status.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
ZT 0↵	OK	**Setup:** ZT=Disable.

Zero-tracking will be performed only on results less than '*ZT*' range at a rate of 0.4 d/sec, where d=display step size (see '*DS*' command). The zero can only be tracked to ±2% of maximum (see '*CM*' command).

ZT=1 means ±0.5d.
ZT=100 means ±50d.

Permitted Values: 0…255.

Factory Default: 0 [Disabled].

5.2.14. IZ Correction of System Zero

This command has no parameters and is used to correct the system zero after a successful calibration, e.g., to correct the unknown weight of a mounting accessory used to hold the calibration weight during the calibration procedure. By applying a simple parallel shift to the gain curve, the sensitivity of the scale will stay unaffected.

Master Sends	Slave Responds With	Meaning
CE↲	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↲	OK	Calibration Sequence Active.
IZ↲	OK	System Zero Corrected.

Factory Default: None.

5.2.15. ZR Zero Range

The zero range (in increments) within which the weighing scale can be zeroed. Issuing the '*ZR*' command without any parameter will return the current value. The zero range must be within ±2% of max '*CM*' value for '*legal-for-trade*' applications and is the default condition, if ZR = 0.

Master Sends	Slave Responds With	Meaning
ZR↲	R+000000	**Request:** Zero Range Value.
CE↲	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↲	OK	Calibration Sequence Active.
ZR 100↲	OK	**Setup:** Zero Range=100dec.

Permitted Values: 0...999999.

Factory Default: 0.

5.2.16. ZI Initial Zero

The *Initial Zero* '*ZI*' (if non-zero) will perform an automatic '*True Zero*' update during the power up sequence. This is dependent upon the weight being within the '*ZI*' range, the *Warm-Up Time* '*WT*' has expired and the '*No-Motion*' window is stable. The '*ZI*' range has a maximum initial zero range of ±10% of maximum capacity '*CM*' value for '*legal-for-trade*' applications.

Master Sends	Slave Responds With	Meaning
ZI↵	Z+000000	**Request:** Initial Zero Range Value.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
ZI 100↵	OK	**Setup:** Initial Zero Range=100dec.

Permitted Values: 0…999999.

Factory Default: 0.

5.2.17. ZN Set/Clear Non-Volatile Zero

This command sets the zero value to volatile or non-volatile. If set to 1 (Non-Volatile), every change in the zero value will write directly to non-volatile memory.

Master Sends	Slave Responds With	Meaning
ZN↵	Z:000	**Request:** ZN=Volatile.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
ZN 1↵	OK	**Setup:** ZN=Non-Volatile.

Note: If using a non-volatile save command (ZN=1), caution should be taken to avoid excessive writes or save operations as this will reduce the lifetime of the internal memory. Any changes made by automatic zeroing functions will not write to non-volatile memory.

Permitted Values: 0…1.

Factory Default: 0 [Volatile].

5.2.18. TM Tare Mode

This command sets the type of tare operation (negative/pre-set). For OIML R76 compatible applications a tare mode of 1 must be used.

Master Sends	Slave Responds With	Meaning
TM↵	M:000	**Request:** Tare Mode=0.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
TM 1↵	OK	**Setup:** Tare Mode=1.

The tare modes are defined in the table below. The clearing of the Pre-set tare will return the system back to Range 1 (when used in multi-range mode & *TM*=0 or 1).

TM Value	Allow Tare of Negative Values	Clear Preset Tare & Return to Range 1 (Multi-Range).
0 (Default)	Yes	Yes
1	No	Yes
2	Yes	No
3	No	No

Permitted Values: 0…3.

Factory Default: 0.

5.2.19. TN Set/Clear Non-Volatile Tare

This command sets the tare value to volatile or non-volatile. If set to 1 (Non-Volatile), every change in tare value will write directly to non-volatile memory!

Master Sends	Slave Responds With	Meaning
TN↵	T:000	**Request:** TN=Volatile.
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
TN 1↵	OK	**Setup:** TN=Non-Volatile.

Note: If using a non-volatile save command (TN=1), caution should be taken to avoid excessive writes or save operations as this will reduce the lifetime of the internal memory. Any changes made by automatic taring functions will not write to non-volatile memory.

Permitted Values: 0…1.

Factory Default: 0 [Volatile].

5.2.20. MTL Maximum Tare Limit

This command caps the maximum tare value accepted by the system.

Master Sends	Slave Responds With	Meaning
MTL↲	M+999999	**Request:** Maximum Tare Limit.
CE↲	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↲	OK	Calibration Sequence Active.
MTL 100000	OK	**Setup:** Set the Max. Tare Value to 100000

Permitted Range: 0…999999.

Factory Default: 999999 [Maximum Tare Limit].

5.2.21. TP Set/Clear Non-Volatile Pre-Set Tare

The '*TP*' command sets the *Preset Tare* value to a volatile or non-volatile state. If *TP*=1 (Non-Volatile), every change in *Preset Tare* '*SP*' will write the value directly to non-volatile memory. If the *Preset Tare* '*SP*' is set when *TP*=0 this will be updated for the session only.

The *Preset Tare* '*SP*' and '*TP*' are affected by *Reset Tare* '*RT*' command. When *TP*=0, the *Preset Tare* '*SP*' value is cleared when a *Reset Tare* '*RT*' command is issued. When *TP*=1, the *Preset Tare* '*SP*' is unaffected by a *Reset Tare* '*RT*' event.

Master Sends	Slave Responds With	Meaning
TP↲	T:000	**Request:** TP=Volatile.
CE↲	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↲	OK	Calibration Sequence Active.
TP 1↲	OK	**Setup:** TP=Non-Volatile.

Note: If using a non-volatile save command (TP=1), caution should be taken to avoid excessive writes or save operations as this will reduce the lifetime of the internal memory. Any changes made by automatic taring functions will not write to non-volatile memory.

Permitted Values: 0…1.

Factory Default: 0 [Volatile].

5.2.22. WT Warm-Up Time

This command defines a time interval after power on to when the output weight values (Net & Gross) are available. During the Warm-Up/initial stabilisation period the ER500 will return '*uuuuuuu*' to the serial comms to avoid displaying false readings when the timer is active. If viewing the front panel display, it will flash the remaining seconds alternating with 'wait'. If *DISP*=3 or '*GS*'/'*SX*' commands are used, the ADC samples will still be available through this period.

Master Sends	Slave Responds With	Meaning
WT↵	W+000000	**Request:** Warm-Up Time=0sec.
CE↵	E+000011 (example)	**Request:** TAC Counter CE 11.
CE 11↵	OK	Calibration Sequence Active.
WT 20↵	OK	**Setup:** Warm-Up Time=20sec.

Permitted Values: 0…65535secs.

Factory Default: 0 [0secs].

5.2.23. FD Reset to Factory Default Settings

This parameter-less command puts the ER500 back to a known factory default state. After successfully issuing the **FD** command the TAC will increment by 1.

Note: All calibration and setup information will be lost by issuing this command! Changes will be made immediately to registers, except the serial port setup and Baud-rate, this will take effect after a reset.

Master Sends	Slave Responds With	Meaning
CE↵	E+000011 (example)	**Request:** TAC Counter CE11.
CE 11↵	OK	Calibration Sequence Active.
FD↵	OK	Factory Default Settings.

Factory Default: None.

5.3. 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 time-period set by '*NT*', during which it cannot fluctuate by more than '*NR*' increments. The '*stability*' flag is reflected in the *Device Status* '*IS*' bytes.

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*'.

5.3.1. NR Set No-Motion Range

This is the range within which the weighing signal can fluctuate and still be considered as '*stable*'.

Master Sends	Slave Responds With	Meaning
NR↵	R+000010	**Request:** NR=10dec.
NR 2↵	OK	**Setup:** NR=2dec.

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

Permitted Values: 1...65535.

Factory Default: 1 [±1divisions].

5.3.2. NT Set No-Motion Time

This is the time-period (in milliseconds) over which the weight signal is checked to be '*stable*'. The weight signal must vary less than '*NR*' divisions over the time-period '*NT*' to be considered '*stable*'.

If the value of '*NT*'=500ms, the output must not fluctuate more than '*NR*' divisions within 500ms to be considered '*stable*'.

Master Sends	Slave Responds With	Meaning
NT↵	T+001000	**Request:** NT=1000ms.
NT 500↵	OK	**Setup:** NT=500ms.

Permitted Values: 1...65535ms.

Factory Default: 1000 [1000ms].

5.4. Filter Setting Commands – FM, FL, UR

Note: All changes to the Filter commands must be stored in non-volatile memory using the '*WP*' command.

A selection of FIR & IIR Filters (selected with '*FM*' command) are provided to eliminate most unwanted disturbances. The *Filter Cut-Off* '*FL*' command is used to define the filter cut-off frequency. The *Update Rate* '*UR*' command is used to define the averaging applied. The filters are applied immediately after the A/D converter and therefore affect all aspects of the weighing operation.

5.4.1. FM Filter Mode

The filter mode selection, FIR or IIR. Select the filter mode for your application.

Master Sends	Slave Responds With	Meaning
FM↵	M:000	**Request:** FM=0 (IIR Filter).
FM 1↵	OK	**Setup:** FM=1 (FIR Filter).

The IIR filter operates as 2nd order low pass filter with Butterworth characteristics. The attenuation is 40dB/decade (12 dB/octave). The digital FIR filter works as a low-pass filter with quicker response (see Mode Characteristics tables).

Permitted Values: 0…1.

Factory Default: 0 [IIR filter].

5.4.2. FL Filter setting

This command defines the -3dB filter cut-off frequency (*see Mode Characteristics tables*).

Master Sends	Slave Responds With	Meaning
FL↵	F:000006	**Request:** FL=6 (1Hz IIR).
FL 1↵	OK	**Setup:** FL=1.

Permitted Values: 0…14.

Factory Default: 3 [Filter 3].

Mode 0 (IIR Filter) Settings/Characteristics

'FL' Setting	Settling Time ms (0.1%)	Cut-Off Frequency (Hz)	Attenuation at 200Hz (dB)	Output Sampling Rate (samples/sec)*
0	No Filtering	-	-	1200
1	60	18	>50	600
2	135	8	>65	600
3	290	4	>75	600
4	385	3	>80	600
5	580	2	>85	600
6	1160	1	>100	600
7	2350	0.5	>110	600
8	4500	0.25	>120	600
9	250	10	>100	40
10	300	5	>100	20
11	450	2	>100	12
12	1300	1	>100	5
13	3000	0.5	>100	2.5
14	4500	0.2	>100	2.5

Mode 1 (FIR Filter) Settings/Characteristics

'FL' Setting	Settling Time ms (0.1%)	-3dB Cut-Off Frequency (Hz)	Damping Frequency at -20dB (Hz)	Damping Frequency at -40dB (Hz)	Stopband Attenuation (dB)	Output Sampling Rate (samples/sec)*
0	14	18	127	164	>100	1200
1	60	19.7	53.1	65.9	>100	600
2	120	9.8	26.6	32.9	>100	300
3	180	6.5	17.3	21.4	>100	200
4	248	4.9	13.2	16.5	>100	150
5	300	3.9	10.6	13.2	>100	120
6	360	3.2	8.6	10.7	>100	100
7	450	2.8	7.3	9.1	>100	85.5
8	480	2.5	6.6	8.2	>100	75
9	Unfiltered	-	-	-	-	40
10	400	10	14.8	16.2	>100	80
11	1050	5	6.6	7.3	>100	40
12	960	1	3.3	4.1	>100	20
13	1450	0.5	1.9	2.4	>100	20
14	1400	0.2	1.7	2.3	>100	10

*Output Rate = Value/2^{UR} samples/sec.

5.4.3. UR Update Rate & Averaging

Depending on the selected filter mode (and the ADC sampling rate) this command defines the averaging for the output value. The permitted settings are from 0 to 7 (*see table below*). The average value is always calculated from 2^{UR} measurement values. The '*UR*' value also sets the Output Data Rate (ODR) of the data from the digital interfaces. The ODR is divided by 2^{UR} e.g., UR=3, the ODR = Sample Rate/8.

Master Sends	Slave Responds With	Meaning
UR↵	U:003	**Request:** Averaging of 8 Values.
UR 7↵	OK	**Setup:** Averaging of 128 Values.

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

Permitted Values: 0…7.

Factory Default: 0 [No Averaging].

5.5. Taring & Zeroing Commands – SZ, RZ, ST, RT, SP, TMV, RMV

The following commands allow setting/reset of the zero and tare values. The zero-point during power-up is determined by *Initial Zero* '***ZI***' and *Calibration Zero* '***CZ***', this is the '*True Zero*'. Additionally, a new '*System Zero*' can be set issuing the '***SZ***' command. If the '***SZ***' command is issued and accepted, all weight values will be based on the new '*System Zero*'.

The '*System Zero*' value is subject to *Set/Reset Zero* '***SZ/RZ***' and *Zero-Tracking* '***ZT***' functions. If the weight is not '*stable*' (as defined by the *No-Motion Range* '***NR***' and the *No-Motion Time* '***NT***') both the *Set Zero* '***SZ***' and *Set Tare* '***ST***' commands will be disabled.

To comply with '*legal-for-trade*' applications, the *Set Zero* '***SZ***' command will be rejected if the proposed '*System Zero*' value exceeds the '*True Zero*' differ by more than ±2% of the '***CM***' value.

5.5.1. SZ Set System Zero

This command has no parameters and is used to set a new '*System Zero*'. This is the basis of all weight values until updated by either *Zero-Tracking* '***ZT***' function, another '***SZ***' command issued or the *Zero Range* '***ZR***' command issued. The *legal-for-trade* limit of ±2% of *Maximum Value* '***CM***' applies to the new zero reference point from the '*true zero*'.

Master Sends	Slave Responds With	Meaning
SZ↵	OK	Set Zero Performed.

The '***SZ***' command will fail (responding with '***ERR***') if the new '*System Zero*' is more than ±2% of the *Maximum Capacity* '***CM***' value based on the '*True Zero*'. The '***SZ***' command will also fail if the weight signal is not '*Stable*' as defined by the *No-Motion Range* '***NR***' and *No-Motion Time* '***NT***'. This is reflected in the *Device Status* '***IS***' command byte.

Factory Default: None.

5.5.2. RZ Reset Zero

This command has no parameters and is used to cancel the '***SZ***' command, reverting the '*System Zero*' back to the '*True Zero*' value.

Master Sends	Slave Responds With	Meaning
RZ↵	OK	Zero Point CZ Active.

Successful acceptance of the '***RZ***' command will return '***OK***'. The '*Zero Action*' bit in the *Device Status* '***IS***' byte will be cleared.

Factory Default: None.

5.5.3. ST Set Tare

This command will activate the net weighing function by storing the current weight value as a tare value. The weight must be '*Stable*' within the limits set by *No-Motion Range* '***NR***' and *No-Motion Time* '***NT***' window. The '*Signal Stable*' bit must be set and for the *Set Tare* '***ST***' command to be accepted.

Master Sends	Slave Responds With	Meaning
ST↲	OK	Tare Performed/Net Operation.

The *Set Tare* '***ST***' command will be accepted, returning '***OK***' and the '*Signal Stable*' and '*Tare Active*' bits will be set in the *Device Status* '***IS***' byte. If the bit is not set, the command will be rejected responding with '***ERR***'.

Factory Default: None.

5.5.4. RT Reset Tare

This command has no parameters and is used to remove the tare weight, returning it to gross mode.

Master Sends	Slave Responds With	Meaning
RT↲	OK	Tare De-Activated/Gross Operation.

The *Reset Tare* '***RT***' command will respond with '***OK***' removing the '*Tare Active*' bit in the *Device Status* '***IS***' byte.

Factory Default: None.

5.5.5. SP Set Pre-Set Tare

This command sets a pre-determined tare value and is saved using the CE/CS commands. The parameter volatility state is determined by '***TP***' and is unaffected by '***TN***'. Applying a *Reset Tare* '***RT***' command will only clear the *Pre-Set Tare* '***SP***' if ***TP***=0 (volatile). If ***TP***=1 (non-volatile), the *Reset Tare* '***RT***' has no effect over the *Preset Tare* '***SP***'. Updating a *Preset Tare* '***SP***' will cancel any *Manual Tare* '***ST***' applied.

Master Sends	Slave Responds With	Meaning
SP↲	T+000000	**Request:** Tare Value.
SP 1000↲	OK	**Setup:** Tare Value=1000divs.

Permitted Values: 0…999999.

Factory Default: 0.

5.5.6. TMV Set Tare (mV/V)

This command will activate the mV/V *NET* function (only for mV/V output) by storing the current value as a tare value. The weight must be '*Stable*' within the limits set by *No-Motion Range* '***NR***' and *No-Motion Time* '***NT***' window. The '*Signal Stable*' bit must be set and for the *Set Tare mV/V* '***TMV***' command to be accepted. This does not modify the '*Tare Active*' bit in the *Device Status* '***IS***' byte.

Master Sends	Slave Responds With	Meaning
TMV↵	OK	Tare Performed/Net Operation.

Factory Default: None.

5.5.7. RMV Reset Tare (mV/V)

This command has no parameters and is used to reset the mV/V Tare (only for mV/V output) back to gross mode.

Master Sends	Slave Responds With	Meaning
RMV↵	OK	Tare De-Activated/Gross Operation.

The *Reset Tare mV/V* '***RMV***' command will respond with '***OK***'.

Factory Default: None.

5.6. Output Commands – GG, GN, GT, GS, GRS, GMV, GW, GA, GL, OF, GH, TH, GM, RM, GO, GV, HW

All the Output commands in this chapter are parameter-less, returning the current snapshot of the requested parameter. These read-only commands do not have a factory default.

Note: Several output commands refer to commands, timing plots or other related information which can be found in subsequent sections e.g., *5.14 Trigger Section*.

5.6.1. GG Get Gross Value

Master Sends	Slave Responds With	Meaning
GG↵	G+001.100	Gross Value: 1100dec.

Factory Default: None.

5.6.2. GN Get Net Value

Master Sends	Slave Responds With	Meaning
GN↵	N+001.000	Net Value: 1000dec.

Factory Default: None.

5.6.3. GT Get Tare Value

Master Sends	Slave Responds With	Meaning
GT↵	T+000.100	Tare Value: 100dec.

Factory Default: None.

5.6.4. GS Get ADC Sample Value (Filtered)

This command retrieves the 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 Sends	Slave Responds With	Meaning
GS↵	S+01257850	ADC Value: 01257850dec.

Factory Default: None.

5.6.5. GRS Get ADC Sample Value (RAW)

This command retrieves the RAW analogue-to-digital converter (ADC) value. This can be useful during development or checking filter effectiveness.

Master Sends	Slave Responds With	Meaning
GRS↵	S+01257850	ADC Value: 01257850dec.

Factory Default: None.

5.6.6. GMV Get mV/V Value

This command provides the input weight value as an integer mV/V value, the corresponding format *x.yyyyy* is the actual mV/V reading.

Master Sends	Slave Responds With	Meaning
GMV↵	M+012345	mV/V Value: 1.2345mV/V.

Factory Default: None.

5.6.7. GW Get Data String (Net, Gross & Status)

Issuing the '*GW*' command, without parameters, will return the net weight, the gross weight, Status bits and the checksum values, all combined into a '*long data string*' format:

W+000100+00110001AF

The first two sections of the return string comprise the net weight and gross weight results, followed by two hexadecimal characters, which represent two bit-mapped status indicators. The last two hexadecimal characters represent the checksum, which is the 2's complement of the sum of all the ASCII values of the string, not including the checksum characters.

W	+000100	+001100	0	1	AF
Leading Character signifies the GW	Net Weight excluding decimal point.	Gross Weight excluding decimal point.	First Status Nibble	Second Status Nibble	Checksum

STATUS	Value=1	Value=2	Value=4	Value=8
Status Bit-1	Not Used.	Output 1 Active.	Output 2 Active.	Output 3 Active.
Status Bit-2	Signal Stable.	Set Zero Performed.	Tare Active.	Not Used.

The checksum is the complement value of the sum of all ASCII values within the data string without the checksum itself.

Master Sends	Slave Responds With	Meaning
GW↲	W+000100+00110001AF (example).	**Net Value:** +000100dec. (no decimal point). **Gross Value:** +001100dec. (no decimal point). **Status bit 1:** 0hex. **Status bit 2:** 1hex. **Checksum:** AFhex.

Example of a long-message format with OF=2 or 3 (includes decimal point).

Master Sends	Slave Responds With	Meaning
GW↲	W+009.971+009.9710122 (example).	**Net Value:** +009.971dec. (no decimal point). **Gross Value:** +009.971dec. (no decimal point). **Status bit 1:** 0hex. **Status bit 2:** 1hex. **Checksum:** 22hex.

Factory Default: None.

5.6.8. GA Get Triggered Average Value

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

Master Sends	Slave Responds With	Meaning
GA↲	A+001.100	Request: 1100g.

Note: For preventing errors during the read out of the data, the register '*GA*' has stored the value 999999 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.

Factory Default: None.

5.6.9. GL Get Data String (Average, Gross & Status)

Master Sends	Slave Responds With	Meaning
GL↵	L+001000+00100501B6 (example).	**Average Value:** +001000dec. (no decimal point). **Gross Value:** +001005dec. (no decimal point). **Status bit 1:** 0hex. **Status bit 2:** 1hex. **Checksum:** B6hex.

For checksum, status bit 1 and status bit 2, see '***GW***' command *(see chapter 0*).

5.6.10. OF Output Format of Data String

This command puts the range information and/or the decimal point into a '*long data string*' format for the '***GW***' and '***GL***' output responses.

Master Sends	Slave Responds With	Meaning
OF↵	F:000000	**Request:** Format Code.
CE↵	E:000012 (example)	**Request:** TAC Counter CE12.
CE 12↵	OK	Calibration Sequence Active.
OF 1↵	OK	**Setup:** OF=1 see table below.

Note: Changes to this command must be saved using the '***CS***' command. This command also adds/removes the range field (decimal point is unaffected) for *Get Gross* '***GG***' and *Get Net* '***GN***' commands.

Output Format

Parameter Setting	Range Information	Decimal Point in GW & GL Response
0 (Factory Default)	No.	No.
1	Yes.	No.
2	No.	Yes.
3	Yes.	Yes.

E.g. when the range information is selected, the data strings will change from G+000000 to Gn+000000, where $1 \leq n \leq 3$.

Permitted Range: 0...3.

Factory Default: 0.

5.6.11. GH Get Hold Value

Issuing the '*GH*' command without parameters will return the current hold weight.

Master Sends	Slave Responds With	Meaning
OP 1↵	OK	Open Device #1.
GH↵	N+001.100	Hold Weight Value: 1100dec.

Factory Default: None.

5.6.12. TH Trigger Hold Value

Saves the latest weight value and holds until a *Get Hold Value* '*GH*' reads back the weight (not a broadcast message).

Master Sends	Slave Responds With	Meaning
TH↵	OK	Save Actual Weight Value.

Factory Default: None.

5.6.13. GM Get Peak Value

The peak value is the maximum value since the last Reset Peak '*RM*' command was issued.

Master Sends	Slave Responds With	Meaning
GM↵	M+051.100	Peak Value: 51100dec.

Factory Default: None.

5.6.14. RM Reset Peak Value

Resets the peak value.

Master Sends	Slave Responds With	Meaning
RM↵	OK	Reset Peak Value.

Factory Default: None.

5.6.15. GO Get Peak-to-Peak Value

The peak-to-peak value is the difference between the peak value and the valley value.

Master Sends	Slave Responds With	Meaning
GO↵	O+091.100	Peak-to-Peak Value: 91100dec.

Factory Default: None.

5.6.16. GV Get Valley Value

The valley value is the minimum value since the last *Reset Peak* '*RM*' command was issued.

Master Sends	Slave Responds With	Meaning
GV↵	V+000.100	Valley Value: 100dec.

Factory Default: None.

5.6.17. HW Hold Weight

Issuing the '*HW*' command without parameters (broadcast command) will latch the current weight in a register for readout later in all ER500s in a common network regardless of their individual addresses.

Master Sends	Slave Responds With	Meaning
HW↵	No Response	Hold Weight Value in Register.

Note: There will no response to broadcast command '*HW*'.

Factory Default: None.

5.7. Auto–Transmit Commands – SG, SN, SX, SMV, SO, SV, SA, SL, SW

The following commands allow the various parameters to be sent continuously. Streaming starts as soon as the relevant command has been issued and finishes when any valid command is received. The continuous transmission will also be interrupted when an invalid command is received responding with '*ERR*'.

5.7.1. SG Stream Gross Value

Master Sends	Slave Responds With	Meaning
SG↲	G+001.100	Gross Value: 1100dec.

Factory Default: None.

5.7.2. SN Stream Net Value

Master Sends	Slave Responds With	Meaning
SN↲	N+001.000	Net Value: 1000dec.

Factory Default: None.

5.7.3. SX Stream ADC Sample Value

This command streams the filtered ADC values '*GS*'.

Master Sends	Slave Responds With	Meaning
SX↲	S+01257850	ADC Sample Value: 01257850dec.

Factory Default: None.

5.7.4. SMV Stream mV/V Sample Value

Master Sends	Slave Responds With	Meaning
SMV↲	M+012345	mV/V Value: 1.2345mV/V

Factory Default: None.

5.7.5. SO Stream Peak-to-Peak Value

Master Sends	Slave Responds With	Meaning
SO↲	P+012345	Peak-to-Peak Value: 12345.

Factory Default: None.

5.7.6. SV Stream Valley Value

Master Sends	Slave Responds With	Meaning
SV	V+012345	Valley Value: 12345.

5.7.7. SA Stream Triggered Average Value

This command will start to auto-transmit the measurement value of the current trigger cycle. Unlike other auto-transmit commands, this command signals the start of a triggered cycle by sending the value ***+999999***. Once a full *Measurement period* '***MT***' has elapsed the calculated average will be transmitted.

There are three ways to setup a trigger for *Triggered Average* '***GA***' or '***SA***' commands. First is using the weight value to trigger a measurement (*Trigger Level* '***TL***' & *Measurement Time* '***MT***' must be set), second is via the *Software Trigger* '***TR***' (*Measurement Time* '***MT***' must be set) and third is via the hardware trigger from the digital inputs (*Measurement Time* '***MT***' must be set).

Master Sends	Slave Responds With	Meaning
SA↵	OK	Auto-Transmit: Started Trigger Average.
SA↵	A+999999	Auto-Transmit: Trigger Period Not Elapsed.
SA↵	A+123456	Auto-Transmit: Averaged Value Ready and Trigger Level Reached.

Factory Default: None.

5.7.8. SL Stream Data String (Average, Gross & Status)

Master Sends	Slave Responds With	Meaning
SL↵	L+000100+00100501B6 (example).	**Average Value:** +000100dec. (no decimal point). **Gross Value:** +001005dec (no decimal point). **Status bit 1:** 0hex. **Status bit 2:** 1hex. **Checksum:** B6hex.

For checksum, status bit 1 and status bit 2 see command '***SW***' (*see chapter 5.7.9*).

Factory Default: None.

5.7.9. SW Stream Data String (Net, Gross & Status)

Issuing the '*SW*' parameter-less command, will stream the net weight, the gross weight, the status and the checksum values, all combined into one single '*long data string*' format:

W+000100+00110001AF

For more detailed information of the data string see command '*GW*' (*see chapter 0*).

Master Sends	Slave Responds With	Meaning
SW↵	W+000100+00110001AF (example).	**Net Value:** +000100dec. (no decimal point). **Gross Value:** +001100dec. (no decimal point). **Status bit 1:** 0hex. **Status bit 2:** 1hex. **Checksum:** AFhex.

STATUS	Value=1	Value=2	Value=4	Value=8
Status Bit-1	Not Used.	Output 1 Active.	Output 2 Active.	Output 3 Active.
Status Bit-2	Signal Stable.	Set Zero Performed.	Tare Active.	Not Used.

The checksum is the reciprocal value of the sum of all ASCII values within the data string without the checksum itself.

Factory Default: None.

5.8. External I/O Control Commands – IN, AI'n', OM, IO

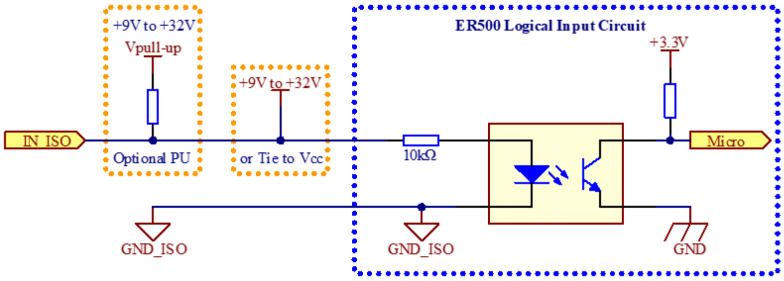
The logical inputs can be detected with the '*IN* command in a binary representation. A further extension to the functionality can be made using the *AI'n'* command to assign actions when an input is detected. This is the hardware trigger mechanism.

Driving GPIOs

The logical inputs and outputs are referenced to the isolated ground (ISO_GND). The GPIOs should not be used with the power GND, chassis, or signal GND.

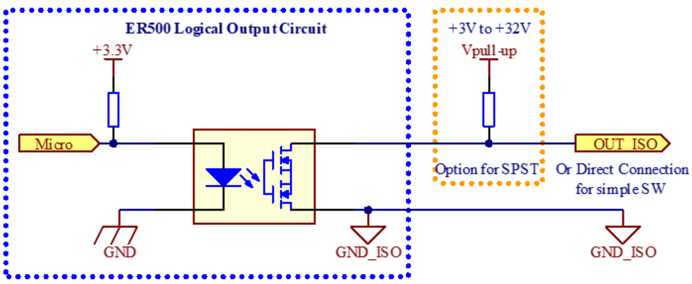
Logical Inputs

The inputs are provided by opto-coupler circuits. This means the inputs require a certain amount of voltage to switch on the photo-diode in the opto-coupler. Typically, applying $+9V_{DC}$ to $+32V_{DC}$ potential on any of the digital inputs (with respect to ISO_GND) will turn the diode on (front panel LED will be signalled). The current limiting is provided by an internal 10kΩ resistor; hence an external pull-up resistor is not required even at $+32V_{DC}$.



Logical Outputs

The outputs consist of a MOSFET relay optically controlled by photo diode. The outputs do not require a pull-up resistor if using as an isolated switch. The MOSFET relay can also be used in a standard relay (SPST-NO) switch to sink 500mA. If using a high supply rail voltage the max. voltage rating for the MOSFET SW is $+60V_{DC}$ or 300mW continuous power rating. It maybe necessary to include a pull-up or current limiting resistance.



5.8.1. IN Read Status of Logic Inputs

Logical input detection can be read back via the read-only command. The command responds with a binary representation in the form of a 4-digit code. The logical inputs are designated high (*1=High*) or low (*0=Low*) states. The External Input status is also displayed on the front panel from *Menu 6.4*.

Master Sends	Slave Responds With	Meaning
IN↵	IN:0000	**Request:** Inputs 1, 2 & 3 Low.
IN↵	IN:0001	**Request:** Input 1 High, Inputs 2 & 3 Low.
IN↵	IN:0010	**Request:** Inputs 1 & 3 Low, Input 2 High.
IN↵	IN:0111	**Request:** Inputs 1, 2 & 3 High.

Factory Default: None.

5.8.2. AI'n' Logical Input Assignment

This command sets up the control assignment linked to the logical inputs. The input, when triggered will cause an action defined using the *AI'n'* command (non-volatile).

Disable Buttons (Option 11)

Disable Buttons option will disable any functionality associated with navigation through the menu structure. The status, indication LEDs and 7-segment display remain active. The recovery sequence is pressing up '↑' and down '↓' buttons together for 0.5sec or deselecting the input assignment with *AI'n'*.

Screen Blanking (Option 14)

Screen Blanking function will disable the 7-segment display and the negative LED indicator (OFF), but front panel buttons and status/GPIO indication LEDs still active. The recovery sequence is pressing up '↑ ' and down '↓' buttons together for 0.5sec or deselecting the input assignment with *AI'n'*.

- 0 – No Function
- 1 – Acts as Zero Button
- 2 – Acts as Tare Button
- 3 – Acts as Reset Tare Button.
- 4 – Starts the Trigger Function
- 5 – Displays the Average Value
- 6 – Displays the Peak Value
- 7 – Deletes the Peak Value
- 8 – Displays the Hold Value.
- 9 – Displays the Peak-to-Peak Value.
- 10 – Displays the Valley Value.
- 11 – Disables the Front Panel keys.
- 12 – Input ‘n’ stores the actual weight (Hold) value.
- 13 – Input ‘n’ tares the display and deletes all other values.
- 14 – Turns off the display.

Master Sends	Slave Responds With	Meaning
AI1↵	AI1:000000	**Request:** Input 1 not Assigned.
AI1 7↵	OK	**Setup:** Assign Input 1 to display Average Value.
AI3 12↵	OK	**Setup:** Assign Input 3 to display Average Value. **Note:** Previous Input 1 assignment not valid.

Permitted Values: 0…14.

Factory Default: 0 [No Assignment].

5.8.3. OM Control of Logic Outputs by Host Application

The logic outputs can be controlled by the host application (as opposed to the normal internal set-points). They are enabled by the '*OM*' command and the appropriate 3-digit binary code. When '*OM*' is set to zero, the user controlled logical outputs '*IO*' are disabled defaulting control to set-points. The test modes (*7.1.5/7.2.5/7.3.5*) accessed via the front panel take priority over set-points/outputs and remain unaffected by the '*OM*' setting. Once the test modes are removed, the original setup is resumed.

Master Sends	Slave Responds With	Meaning
OM↵	OM:0000	**Request:** Set-Point Assigned.
OM↵	OM:0111	**Request:** GPIO Outputs Enabled.

A logic '*1*' bit in the code enables the corresponding logic output to be controlled by the host application using the '*IO*' command. A logic '*0*' in the code leaves the corresponding logic output controlled by the internal set-point. Output 1 is the least significant bit.

Permitted Values: 0000…0111.

Factory Default: 0000 [Outputs Assign Set-points].

5.8.4. IO Read/Modify Status of Logic Outputs

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 4-digit binary code where 0=Low and 1=High (outputs are open-drain MOSFETs), the least significant bit corresponds to Out1.

The status of the outputs can be changed by issuing the '*IO*' command with the appropriate 4-digit code e.g., *IO 0001*. The status of the logic outputs is normally determined by the internal set-points or manually setting the '*IO*' and '*OM*' output mask.

Master Sends	Slave Responds With	Meaning
IO↵	IO:0001	**Request:** GPIO Output 1 High.
IO 1↵	OK	**Setup:** Set GPIO Output 1 High.
IO 101↵	OK	**Setup:** Set GPIO Outputs 1 & 3 High.
IO 111↵	OK	**Setup:** Set GPIO Outputs 1, 2 & 3 High.

Permitted Values: 0000…0111.

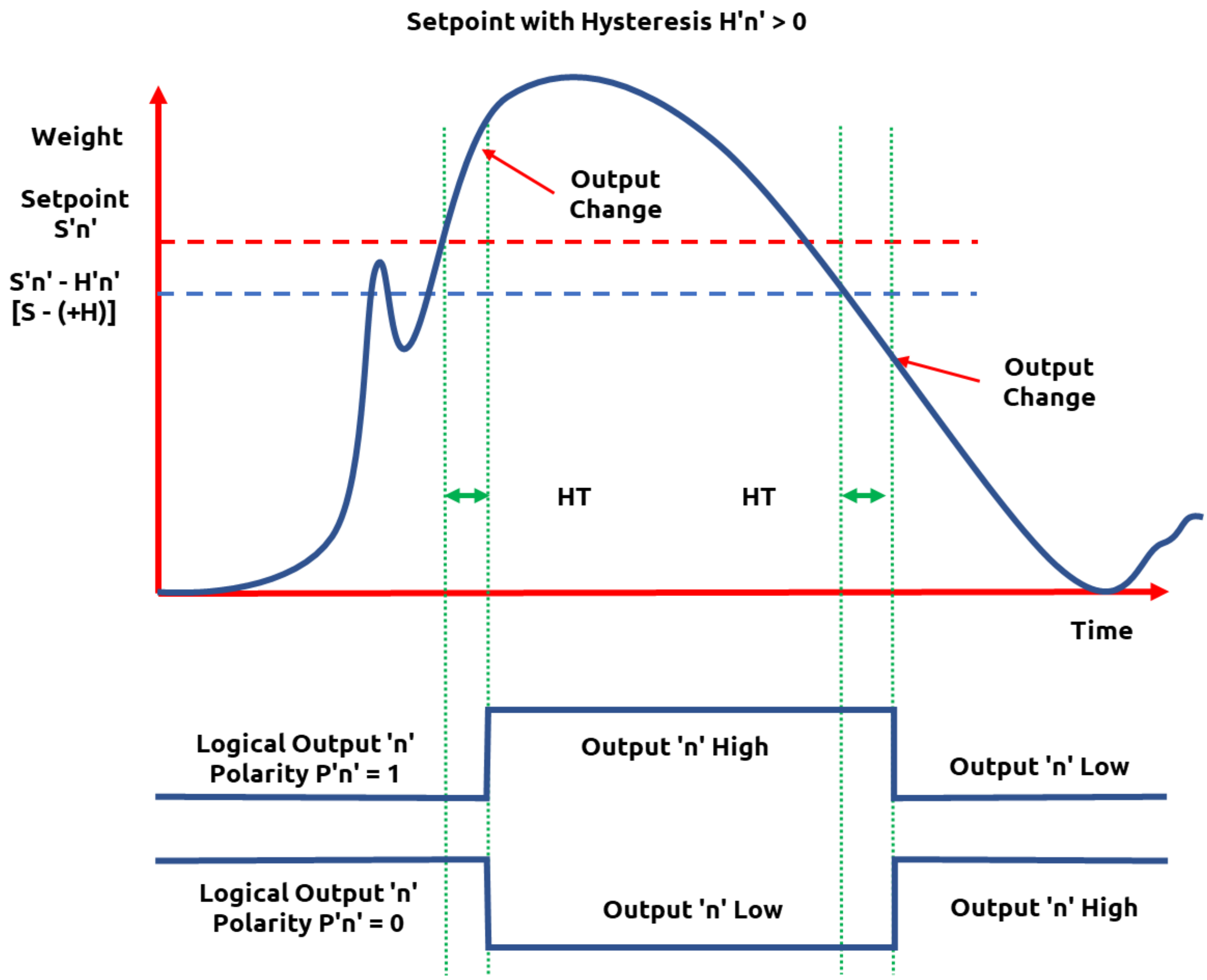
Factory Default: 0000 [GPIO Outputs Low].

5.9. Set-Point Output Commands – S'n', H'n', A'n', P'n', HT

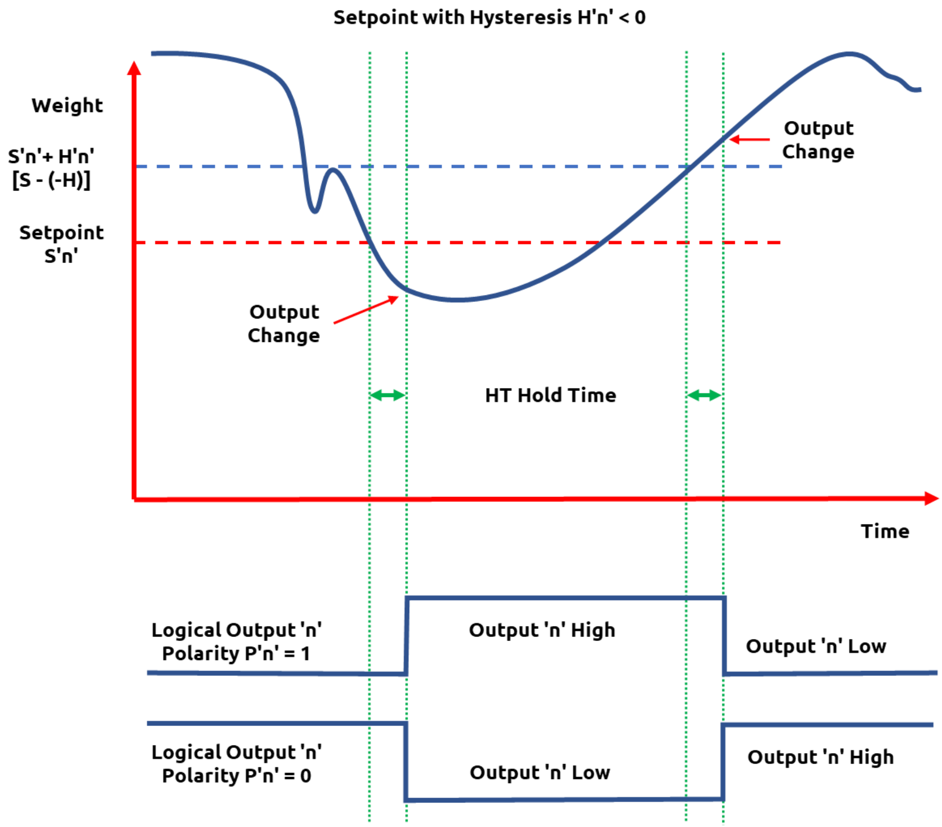
Each logic output can be assigned to an independent Set-Point value *S'n'* with a corresponding Hysteresis *H'n'* action and Set-Point Allocation *A'n'*.

The operation of the set-points is interrupted when using the logical output test modes in the menu (*7.1.5/7.2.5/7.3.5*). Care should be taken when using the test modes as they are persistent and only turned off when deselected in menu (*7.1.5/7.2.5/7.3.5*).

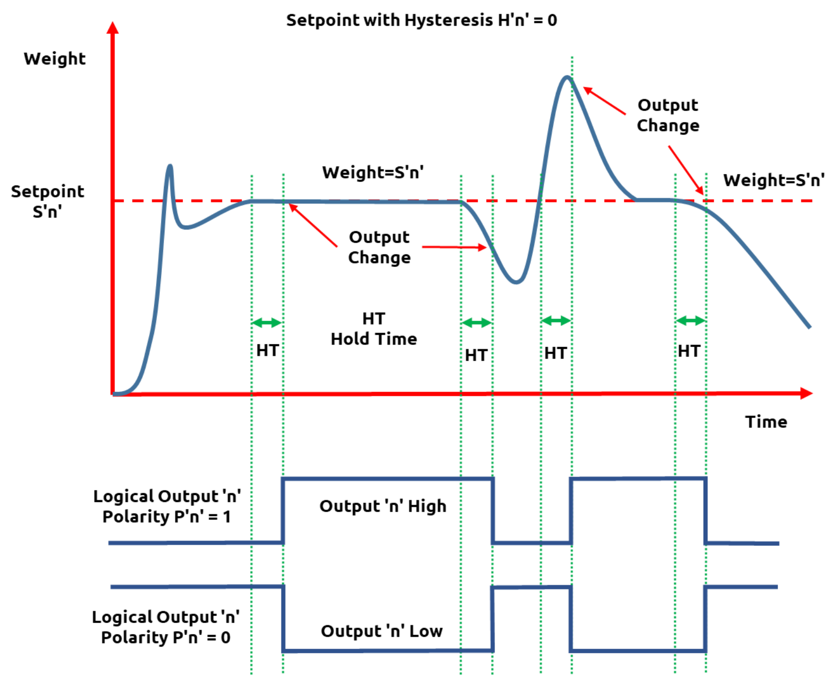
Note: All changes to the set-point commands are stored in non-volatile memory using the *Save Set-Point* '*SS*' command.



Set-Point with Hysteresis < 0



Set-Point with Hysteresis = 0



5.9.1. S'n' Set-Point Value

A set-point is the trigger level that causes action of the output channel, according to the settings of the controls *A'n'* and *H'n'*.

Master Sends	Slave Responds With	Meaning
S1↵	S1+010000	**Request:** Set-Point S1=10000dec.
S1 3000↵	OK	**Setup:** Set-Point S1=3000dec.
S2↵	S2+011000	**Request:** Set-Point S2 11000dec.
S2 5000↵	OK	**Setup:** Set-Point S2=5000dec.

Permitted Range: ±999999.

Factory Default: 999999.

5.9.2. H'n' Hysteresis & Switching Action for Set-Point

The set-point switching logic is defined by the numeric value **and** polarity of the hysteresis.

Master Sends	Slave Responds With	Meaning
H1↵	H1+000001	**Request:** Setup Hysteresis of Set-Point S1.
H1 100↵	OK	**Setup:** Positive Hysteresis +100dec. for Set-Point S1.
H2↵	H2+000001	**Request:** Setup Hysteresis of Set-Point S2.
H2 -5000↵	OK	**Setup:** Negative Hysteresis -5000dec. for Set-Point S2.

Permitted Range: ±999999.

Factory Default: 0.

5.9.3. A'n' Source Allocation for Set-Point

Set the source for *Set-Point* '*n*'. This source will trigger the required action of the output channel, according to the settings of the controls *S'n'* and *H'n'*.

Choose the source for the set-point *'n'*.

- 0 – Gross Weight.
- 1 – Net Weight.
- 2 – Peak Value (Maximum).
- 3 – Average Weight.
- 4 – Hold Value.
- 5 – Peak-to-Peak Value.
- 6 – Valley Value (Minimum).
- 7 – Error 4 or Error 5.

Master Sends	Slave Responds With	Meaning
A1↵	A1+000000	**Request:** Setup Net for Set-Point S1.
A1 1↵	OK	**Setup:** Source Net for Set-Point S1.
A2↵	A2+000001	**Request:** Setup Net for Set-Point S2.
A121↵	OK	**Setup:** Source Net for Set-Point S2.

Permitted Range: 0…7.

Factory Default: 1 [Net Weight].

5.9.4. P'n' Set-Point Polarity

This command defines polarity for the logical outputs. The logical outputs switch when the set-points *S'n'* are triggered. A positive transition (low-to-high) is made in the logical output (*P'n'*=0). When set-point trigger condition is not valid, the logical outputs will change transition (high-to-low). The logical output polarity is reversed when *P'n'*=1.

Master Sends	Slave Responds With	Meaning
P1↵	P1+000000	**Request:** Set-Point Polarity OFF.
P1 1↵	OK	**Setup:** S1 Set-Point ON.

Permitted Range: 0…1.

Factory Default: 1 [Polarity based on low-to-high edge].

5.9.5. HT Hold-Time for All Set-Points

This command defines the hold-time for the set-point limit. The signal must exceed the set-point limit continuously at least for this time-period before a switch event will be initiated.

Master Sends	Slave Responds With	Meaning
HT↵	H+000000	**Request:** HT=0ms.
HT 200↵	OK	**Setup:** HT=200ms.

Note: This setup will apply to all set-points.

Permitted Range: 0…65535ms.

Factory Default: 0 [0ms].

5.10. Communication Commands – AD, BR, DX, CL, OP, TD, STR, MOD

Note: All changes to the communications commands must be stored to non-volatile memory using the '*WP*' command.

5.10.1. AD Device Address – Serial Channel

This command can set up the device address in the range from 0 to 254.

Master Sends	Slave Responds With	Meaning
AD↵	A:000	**Request:** Address 0.
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, the address changes will not take effect until the unit has been restarted or has received a *Software Reset* '*SR*' command.

Permitted Values: 0…254.

Factory Default: 0 [Always Listening for Bus Activity].

5.10.2. BR Baud-Rate – Serial Channel

The following Baud-rates can be setup: 9600, 19200, 38400, 57600, 115200, 230400 and 460800Bits/s.

Note: The updated data-rate will only be active when the new Baud-rate has been saved with the '*WP*' command and a power cycle or *Software Reset* '*SR*' applied. This also applies to a '*Factory Default*' '*FD*' command.

Master Sends	Slave Responds With	Meaning
BR↵	B:9600	**Request:** 9600Baud.
BR 230400↵	OK	**Setup:** 230400Baud.

Permitted Values: 9600…460800.

Factory Default: 9600 [9600Baud].

5.10.3. DX Full-Duplex – Serial Channel

Note: This option needs to be set in accordance with the physical setup of the bus configuration e.g., RS-485. Care should also be taken when using half-duplex configuration and using high '*TD*' values.

Master Sends	Slave Responds With	Meaning
DX↵	X:000	**Request:** DX=0 (Half-Duplex).
DX 1↵	OK	**Setup:** DX=1 (Full-Duplex).

Permitted Values: 0…1.

Factory Default: 0 [Half-Duplex].

5.10.4. CL Close Device

This command is parameter-less and sends a broadcast message to the current active address (see *Device Address* '*AD*') or devices active on the bus.

Master Sends	Slave Responds With	Meaning
CL↵	OK	Close Connected Device.

Factory Default: None.

5.10.5. OP Open Device

This command, if sent without parameters, returns the address of the active device. The requested device acknowledges its readiness and responds to all bus commands until a further '*OP*' command arrives with a different address, or a '*CL*' command is received.

Master Sends	Slave Responds With	Meaning
OP↵	O:003	**Request:** Device #3 is Open.
OP 14↵	OK	**Setup:** Open Device #14.

Permitted Values: 0…254.

Factory Default: 0 [Always Listening].

5.10.6. TD Transmission Delay

This command allows equipment attached to the RS-485 bus to reconfigure between receiver and transmitter. Time delays from 0 to 255ms are available before any response from the ER500 is sent. This delay may be necessary in some two wire applications ('*half-duplex*') as it allows for external equipment to reconfigure if using shared resources. The delay is only applicable when '*DX*' command is set to zero ('*half-duplex*' mode).

It should be noted, using '*TD*' with high delay may cause any command sent during this delay period to be ignored until the delay period has elapsed. If using the search feature within FDC application software and the '*TD*' is very high, this may take some time!

Master Sends	Slave Responds With	Meaning
TD↵	T+000020	**Request:** Delay Time 20ms.
TD 100↵	OK	**Setup:** Delay=100ms.

Permitted Values: 0...255ms.

Factory Default: 20 [20ms].

5.10.7. STR Set RS-485 Termination Resistance

Master Sends	Slave Responds With	Meaning
STR↵	T:000	Termination Resistor: Disabled.
STR 0↵	OK	RS-485 120Ω Termination Disabled.
STR 1↵	OK	RS-485 120Ω Termination Active.

Permitted Values: 0...1.

Factory Default: 1 [Termination ON].

5.10.8. MOD Modbus Configuration

0 - Modbus OFF
1 - Modbus ASCII
2 - Modbus RTU
3 - Modbus TCP [Allocated but not used – No setup required to use Modbus TCP].

Master Sends	Slave Responds With	Meaning
MOD↵	MOD:000	**Request:** Modbus OFF.
MOD 3↵	OK	**Setup:** Modbus TCP Active.

Permitted Values: 0...3.

Factory Default: 0 [Modbus OFF].

5.11. Save Calibration & Setup Data Commands – CS, WP, SS, AS, SDD

A variety of calibration and setup parameters have been divided into 5 groups with individual save parameters commands:

- Save *Calibration* Parameters '*CS*'.
- Save *Setup* Parameters '*WP*'.
- Save *Set-Points* Parameters '*SS*'.
- Save *Analogue Output* Parameters '*AS*'.
- Save *Dosing/Filling* Parameters '*SDD*'.

5.11.1. CS Save Calibration Data

This command saves the calibration data causing the TAC to be incremented. The '*CS*' command saves changes made using '*Calibration*' group commands. The Output Format command '*OF*' is also included.

Calibration data can only be saved if the TAC code is known and precedes the '*CS*' command. The command returns '*ERR*' unless it is preceded by the '*CE xx*'.

Master Sends	Slave Responds With	Meaning
CE↵	E+000013	**Request:** TAC Counter CE13.
CE 13↵	OK	Calibration Sequence Active.
CS↵	OK	Calibration Values Saved.

Factory Default: None.

5.11.2. WP Save Setup Parameters

The settings of the following groups, '*Motion Detection*', '*Filter Settings*', '*Tare & Zeroing*', '*IO Control*', '*Communications*', '*Network*' & '*Trigger*' are saved with the '*WP*' command. The '*WP*' command returns '*ERR*' if there is a restriction or if the format is incorrect.

Master Sends	Slave Responds With	Meaning
WP↵	OK	Setup Data Saved.

Factory Default: None.

5.11.3. SS Save Set-Point Parameters

The '*Set-Points*' group will be saved using the '*SS*' command. The '*SS*' command returns '*ERR*' if there is a restriction or if the format is incorrect.

Master Sends	Slave Responds With	Meaning
SS↵	OK	Set-Point Parameter Saved.

Factory Default: None.

5.11.4. AS Save Analogue Output Parameters

The '*Analogue Output*' group will be saved using the '*AS*' command. The '*AS*' command returns '*ERR*' if there is a restriction or if the format is incorrect.

Master Sends	Slave Responds With	Meaning
AS↵	OK	Analogue Parameter Saved.

Factory Default: None.

5.11.5. SDD Save Bottle/Filling Parameters

The '*Dosing/Filling*' group will be saved using the '*SDD*' command. The '*SDD*' command returns '*ERR*' if there is a restriction or if the format is incorrect.

Master Sends	Slave Responds With	Meaning
SDD↵	OK	Filling/Bottle Parameter Saved.

Factory Default: None.

5.12. Analogue Output Commands – AP, AM, AL, AH, SLEW, SRC, SRS

The *Analogue Outputs* are configurable for both current and voltage output. The DAC outputs can also be linked to the weight/calibration points of the system (using '*AL*' & '*AH*') or to user defined range specified by the user. The default setting is to indirectly link to the system calibration of 10,000 divisions (i.e., AH=10000 aligns to 20mA or +10V).

Note: All *Analogue Output* commands are stored in non-volatile memory using the '*AS*' command. When setting up the configuration, ensure the condition '*AL*' ≤ '*AH*' is preserved.

Fault Range Limits

The range extremes have a 10% limit (of max) applied to avoid nuisance tripping. Anything beyond the 10% limits will cause a designated fault value to be applied. The fault limits '*AL*'-10% & '*AH*'+10% refer to the DAC output range, but if aligned with the weight calibration, then an indirect relationship is also present.

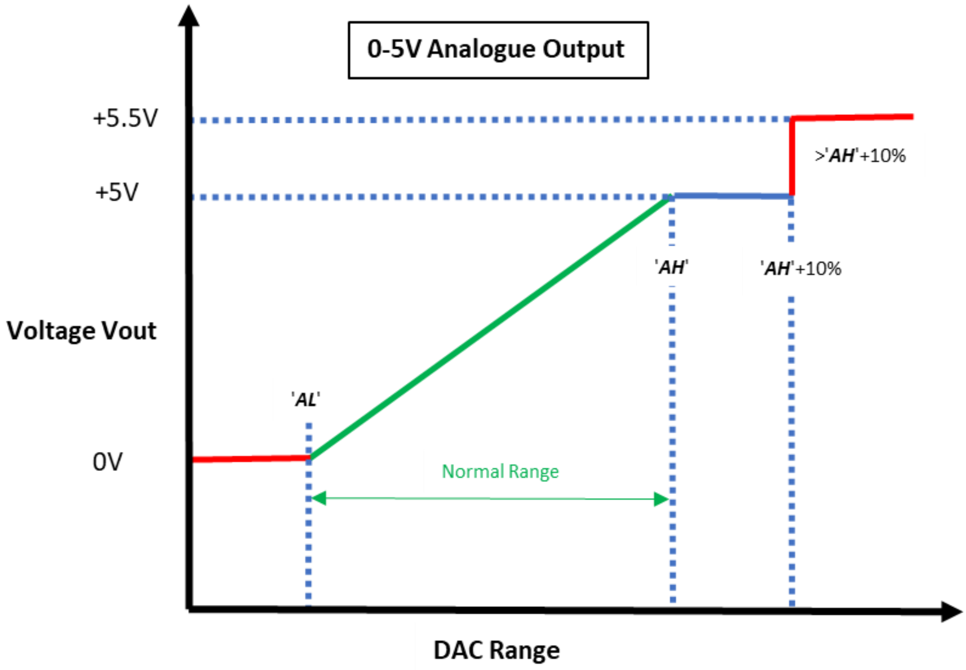
Current Output

The lower limit is 0mA (0-20mA & 4-20mA ranges).
The higher limit is 24mA (0-20mA & 4-20mA ranges).

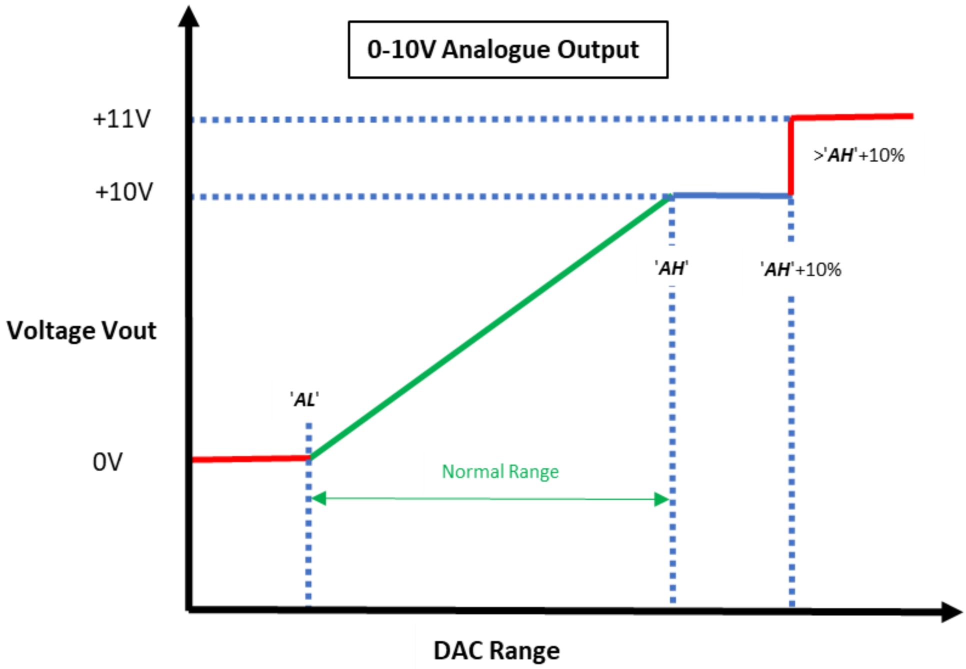
Voltage Output

The lower limit is 0V (0V to +5V & 0V to +10V ranges) and for balanced outputs -5.5V (±5V range) or -11V (±10V range). The higher limit is +5.5V (0V-5V & ±5V ranges) or +11V (0-10V & ±10V ranges).

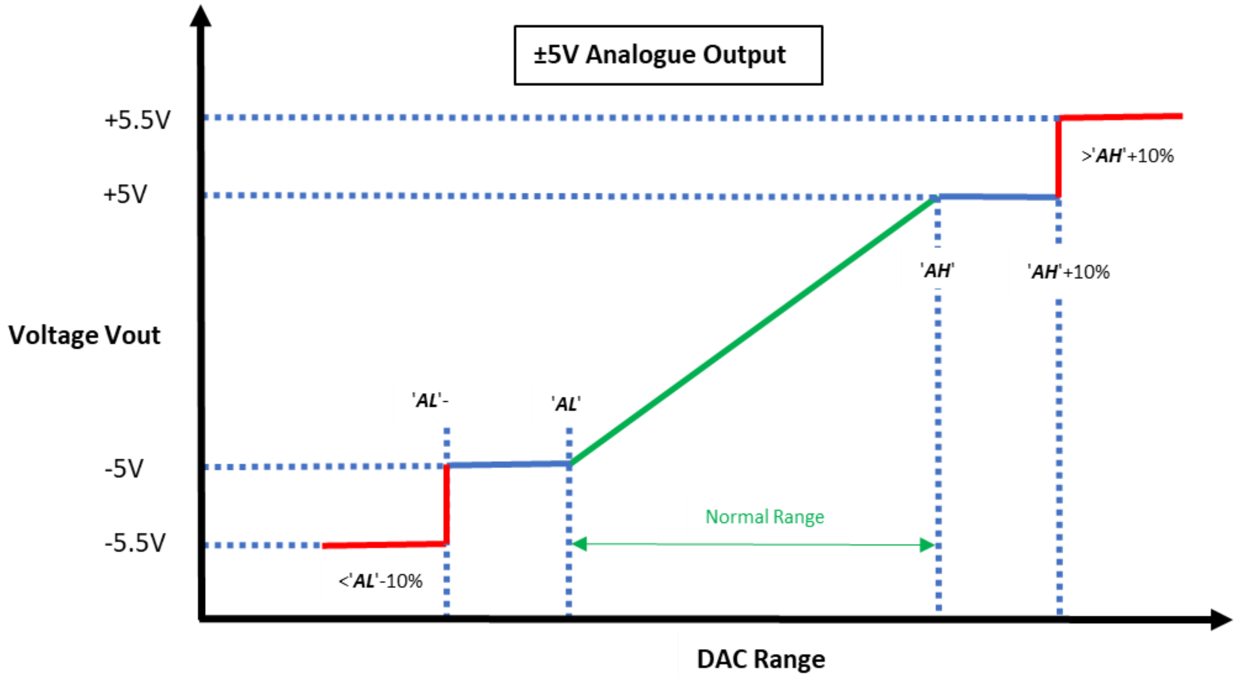
Voltage Output (0 to +5V)



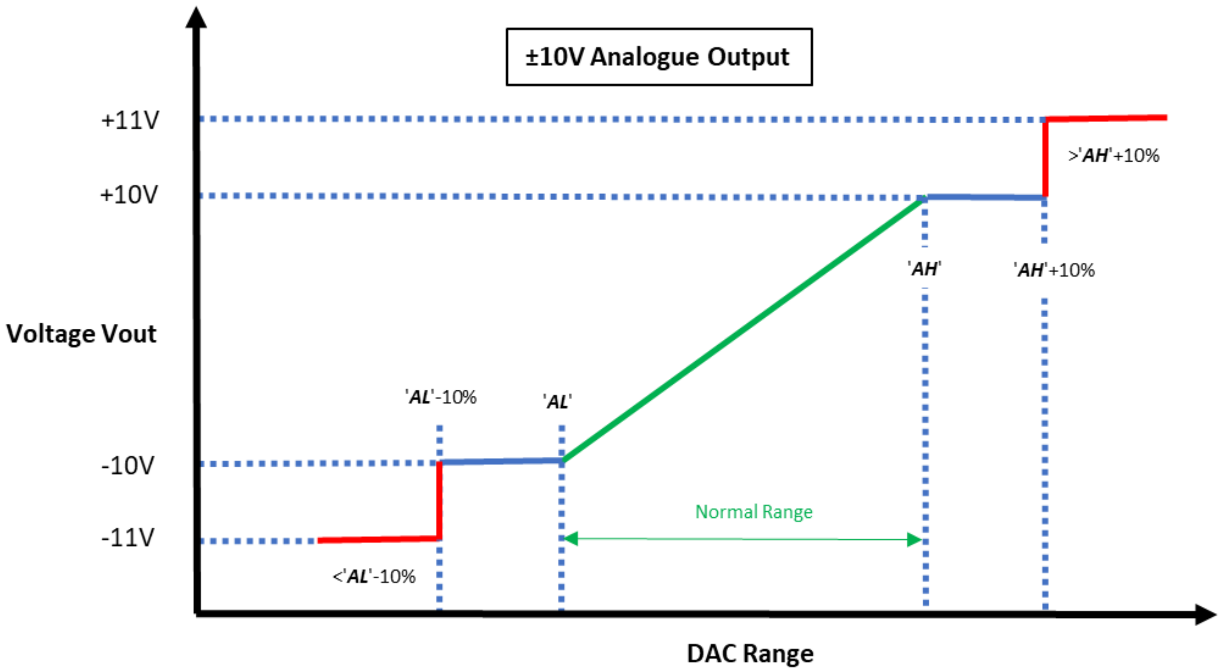
Voltage Output (0 to +10V)



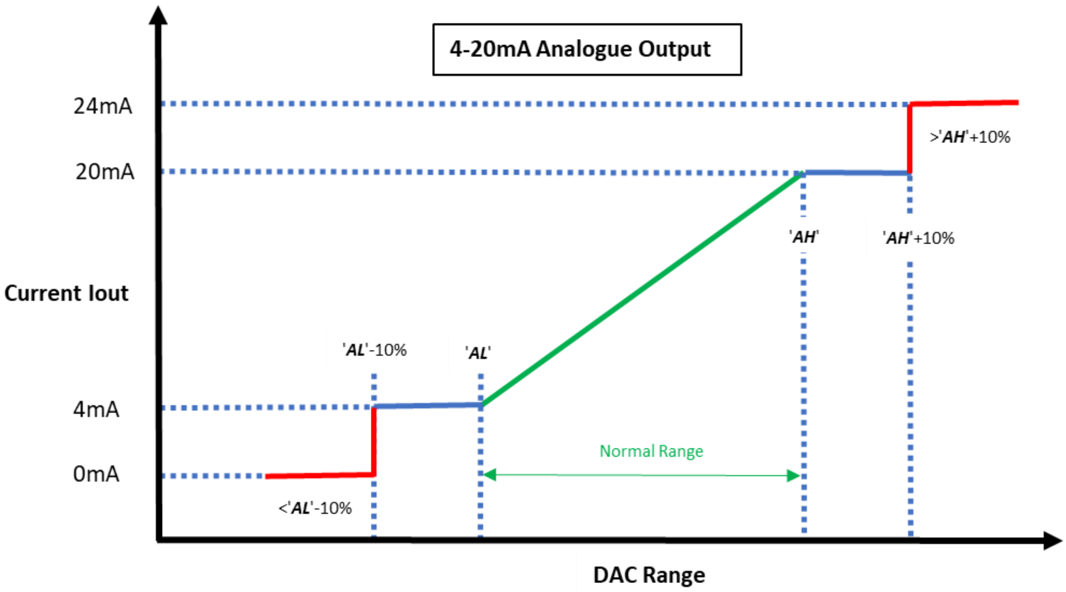
Voltage Output (±5V)



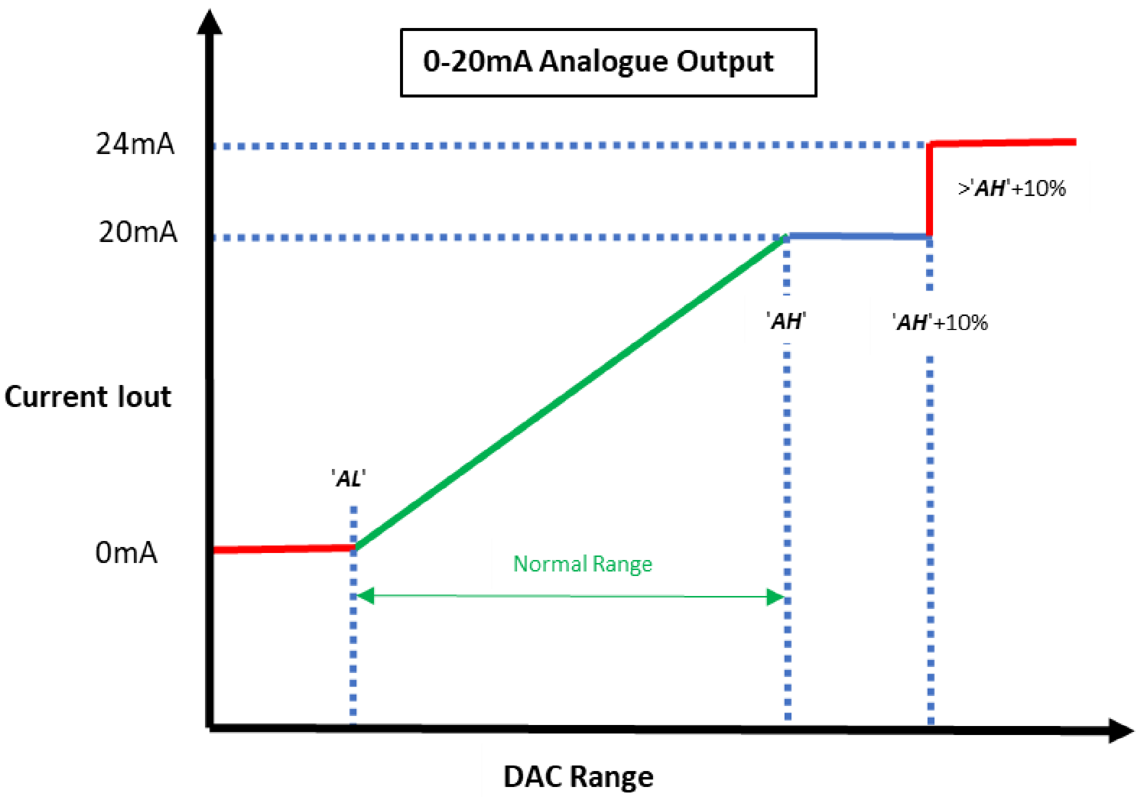
Voltage Output (±10V)



Current Output (4 to 20mA)



Current Output (0 to 20mA)



5.12.1. AP Analogue Output Parameter Assignment

This is the *Analogue Output* port parameter assignment. A variety of parameters can be assigned to the analogue output ports.

- 0 – Analogue Output Assigned to Gross value.
- 1 – Analogue Output Assigned to Net value.
- 2 – Analogue Output Assigned to Peak value.
- 3 – Analogue Output Assigned to Average value.
- 4 – Analogue Output Assigned to Hold value.
- 5 – Analogue Output Assigned to Peak-Peak value.
- 6 – Analogue Output Assigned to Valley value.
- 7 – Analogue Output Assigned to Display value (valid only for DISP=1 & DISP=2).
- 8 – Analogue Output is switched OFF.

Master Sends	Slave Responds With	Meaning
AP↵	A:000	**Request:** Analogue Assignment Status.
AP 6↵	OK	**Setup:** Assign Analogue to follow Valley.

Permitted Range: 0-8.

Factory Default: 1 [Analogue Output Assigned to Net Value].

5.12.2. AM Analogue Mode

This is the *Analogue Output* port configuration assignment. The analogue outputs are capable current mode, voltage mode or both simultaneously. Each option is bit assigned; the selection is via the decimal equivalent. All combinations of current and voltage outputs are available as specified below e.g., AM=130 sets 4-20mA current output and voltage output to ±10V.

- 0 – Analogue Output OFF.
- 1– Analogue Output Mode set to 0 to 20mA Range.
- 2 – Analogue Output Mode set to 4 to 20mA Range.
- 4 – Do Not Use – Invalid Setting.
- 8 – Do Not Use – Invalid Setting.
- 16 – Analogue Output Mode set to 0V to +5V Range.
- 32 – Analogue Output Mode set to 0V to +10V Range.
- 64 – Analogue Output Mode set to ±5V Range.
- 128 – Analogue Output Mode set to ±10V Range.

Master Sends	Slave Responds With	Meaning
AM↵	M:000	**Request:** Analogue Mode Status.
AM 2↵	OK	**Setup:** Assign Analogue 4 to 20mA.

Permitted Range: 0-130.

Factory Default: 0 [Analogue Output OFF].

5.12.3. AL Analogue Minimum

Analogue output DAC minimum assignment value. This is the lower reference point of the DAC, e.g., AL=4mA point for a 4-20mA current output and AL=-10V for a ±10V range.

Master Sends	Slave Responds With	Meaning
AL↵	L+000000	**Request:** Analogue Low Status.
AL 100↵	OK	**Setup:** Assign 100 to min. Value.

Permitted Range: ±999999.

Factory Default: 0.

5.12.4. AH Analogue Maximum

Analogue output DAC maximum assignment value. This is the upper reference point of the DAC, e.g., AH=20mA point for a 4-20mA current output and AH=+10V for a ±10V range.

Note: '*AH*' value must be greater than or equal to '*AL*' to be accepted as a valid value.

Master Sends	Slave Responds With	Meaning
AH↵	H+000000	**Request:** Analogue High Status.
AH 10000↵	OK	**Setup:** Assign 10,000 to max. Value.

Permitted Range: ±999999.

Factory Default: 10000.

5.12.5. SLEW DAC Slew Rate Enable

Analogue output DAC Slew rate control. Applies to both current and voltage outputs. Use the *Slew Rate Update Frequency' **SRC*** and *Slew Rate Set Size' **SRS*** to tailor the DAC output response.

Master Sends	Slave Responds With	Meaning
SLEW↵	S:000	**Request:** Analogue DAC Slew OFF.
SLEW 1↵	OK	**Setup:** Enable Analogue DAC Slew ON.

Permitted Range: 0…1.

Factory Default: 0.

5.12.6. SRC DAC Slew Rate Update Frequency

Analogue output DAC Slew rate control. Applies to both current and voltage outputs.

SRC Setting	Update Frequency
SRC=0	258065Hz
SRC=1	200000Hz
SRC=2	153845Hz
SRC=3	131145Hz
SRC=4	115940Hz
SRC=5	69565Hz
SRC=6	37560Hz
SRC=7	25805Hz
SRC=8	20150Hz
SRC=9	16030Hz
SRC=10	10295Hz
SRC=11	8280Hz
SRC=12	6900Hz
SRC=13	5530Hz
SRC=14	4240Hz
SRC=15	3300Hz

Master Sends	Slave Responds With	Meaning
SRC↵	C:000	**Request:** DAC Slew Update 258065Hz.
SRC 1↵	OK	**Setup:** DAC Slew Update 200kHz.

Permitted Range: 0…15.

Factory Default: 0.

5.12.7. SRS Slew Rate Set Size

Analogue output DAC Slew rate control. Applies to both current and voltage outputs.

SRS Setting	Slew Step Size
SRS=0	1
SRS=1	2
SRS=2	4
SRS=3	8
SRS=4	16
SRS=5	32
SRS=6	64
SRS=7	128

Master Sends	Slave Responds With	Meaning
SRS↵	S:000	**Request:** DAC Slew Step Size.
SRS 7↵	OK	**Setup:** DAC Slew Step Size 128.

Permitted Range: 0…7.

Factory Default: 0.

5.13. Network Commands – NA, DA, NG, DH, NM, MA

Note: All *Network* commands are stored in non-volatile memory using the '*WP*' command (except for read-only registers e.g., '*DA*' & '*MA*').

Note: If using a browser to display the webserver, it may be necessary to remove leading zeros from the IP address (e.g. 192.168.001.100 → 192.168.1.100).

5.13.1. NA Static IP Address

A static IP address can be assigned (with '*NA*' and '*DH*=0). This follows the IPv4 standard.

Master Sends	Slave Responds With	Meaning
NA↵	A:192.168.1.100	**Request:** Static IP.
NA 192.168.1.123↵	OK	**Setup:** 192.168.1.123

Permitted Range: 0…255.

Factory Default: 192.168.1.100

5.13.2. DA Current IP Address

The current network IP address is a read-only register. It is updated when the current assigned IP address changes. Note, this may differ from the '*NA*' command e.g., if a DHCP server is being used ('*DH*').

Master Sends	Slave Responds With	Meaning
DA↵	A:192.168.1.100	**Request:** Current IP.

5.13.3. NG Default Gateway Address

Master Sends	Slave Responds With	Meaning
NG↵	G:192.168.1.1	**Request:** Gateway Address.
NG 192.168.1.123↵	OK	**Setup:** 192.168.1.123

Permitted Range: 0…255.

Factory Default: 192.168.1.1

5.13.4. DH DHCP Allocation

Provision for ER500 to work with a DHCP server when set to *DH*=1.

Master Sends	Slave Responds With	Meaning
DH↵	DH:0	**Request:** DHCP Status.
DH 1↵	DH:1	**Setup:** DHCP ON.

Permitted Range: 0…1.

Factory Default: 0 [DHCP OFF].

5.13.5. NM Network Mask

Master Sends	Slave Responds With	Meaning
NM↵	M:255.255.255.0	**Request:** Network Mask.
NM 255.255.255.100↵	OK	**Setup:** 255.255.255.100

Permitted Range: 0…255.

Factory Default: 255.255.255.0.

5.13.6. MA MAC ID Address

The identification of the ER500 unique hardware number (MAC Address) is possible using the read-only register '*MA*'.

Master Sends	Slave Responds With	Meaning
MA↵	M:04-C3-E6-Bx-xx-xx	**Request:** MAC ID.

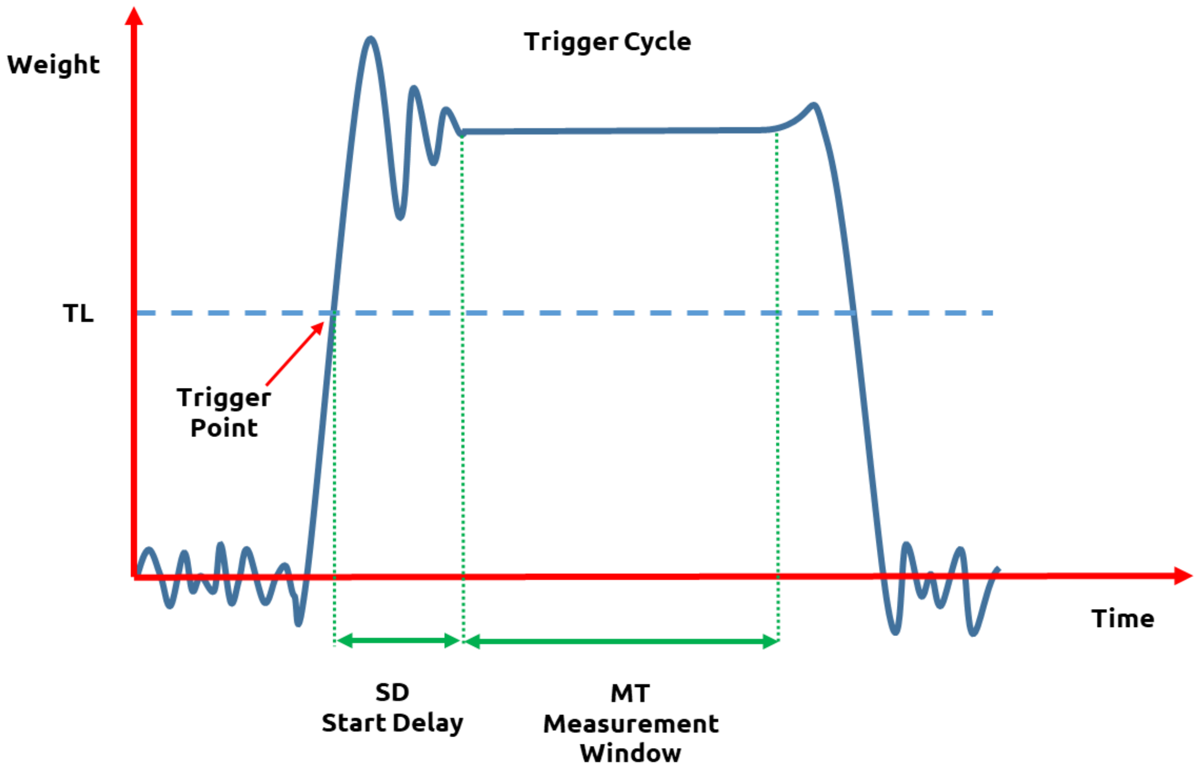
Factory Default: 04:C3:E6:Bx:xx:xx [Set in Factory – Unique Address].

5.14. Trigger Commands – SD, MT, TL, TE, TR

The trigger feature can be used to make an average measurement over '*MT*' time-period based on weight. This is not the only trigger mechanism, the ER500 has a *Software Trigger* '*TR*' and *Hardware Trigger* from the logical inputs. The software trigger manually triggers a measurement cycle, while the logical inputs can have a variety of actions assigned using the *AI'n'* command.

There are three ways to setup a trigger for Triggered Average '*GA*' or '*SA*' commands. First is using the weight value to trigger a measurement (*Trigger Level* '*TL*' & *Measurement Time* '*MT*' must be set), second is via the *Software Trigger* '*TR*' (*Measurement Time* '*MT*' must be set) and third is via the hardware trigger from the digital inputs (*Measurement Time* '*MT*' must be set).

Note: All changes to the trigger commands must be stored in non-volatile memory using the '*WP*' command (except '*TR*'). The standard trigger functions are unavailable when a filling cycle is in operation as the GPIO outputs have defined functionality.



5.14.1. SD Start Delay Time

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

Master Sends	Slave Responds With	Meaning
SD↵	S+000100	**Request:** SD=100ms.
SD 200↵	OK	**Setup:** SD=200ms.

Permitted Values: 0…65535ms.

Factory Default: 0 [0ms].

5.14.2. MT Measuring Time

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

Master Sends	Slave Responds With	Meaning
MT↵	M+000100	**Request:** MT=100ms.
MT 500↵	OK	**Setup:** MT=500ms.

Note: Setting '*MT*'=0 disables the trigger function and the averaging.

Permitted Values: 0…3000ms.

Factory Default: 0ms [Trigger Disabled].

5.14.3. TR Software Trigger

This command starts a measurement cycle. Its execution can be compared to a hardware trigger on any of the digital input channels, dependent upon *AI'n'* setting.

Master Sends	Slave Responds With	Meaning
TR↵	OK	Trigger Event.

Note: If a measurement cycle is already active, the unit will respond with '*ERR*'.

Factory Default: None.

5.14.4. TL Trigger Level

This command defines a weight level on a rising edge to trigger the measurement cycle. The basic setup is via *Measurement Time* '***MT***' and *Trigger Level* '***TL***'.

When using '***TL***' to trigger a weight measurement, the trigger point is only the starting point of the process. The measurement must be above the '***TL***' level for the '***MT***' time-period.

All trigger possibilities are available in parallel. Setting the *Trigger Level* '***TL***' to its maximum value (***TL***=999999) disables the weight trigger for automatic weight measurements (hardware and software will remain active).

Master Sends	Slave Responds With	Meaning
TL↵	T+999999	**Request:** TL=999999.
TL 1000↵	OK	**Setup:** TL=1000.

Note: If a measurement cycle is already active, the unit will respond with '***ERR***'. During an active measurement period, the measurement cycle cannot be stopped or interrupted by sending another trigger event. The system will process the first event to completion, ignoring other triggers.

Permitted Values: 0…999999.

Factory Default: 999999 [Weight Measurement Trigger Disabled].

5.14.5. TE Trigger Edge

This command can only be used in conjunction with a hardware trigger on the digital input channels (this is not a weighing trend command). This command configures the detection sequence the ER500 will use to trigger an action based on the ***AI'n'*** setting.

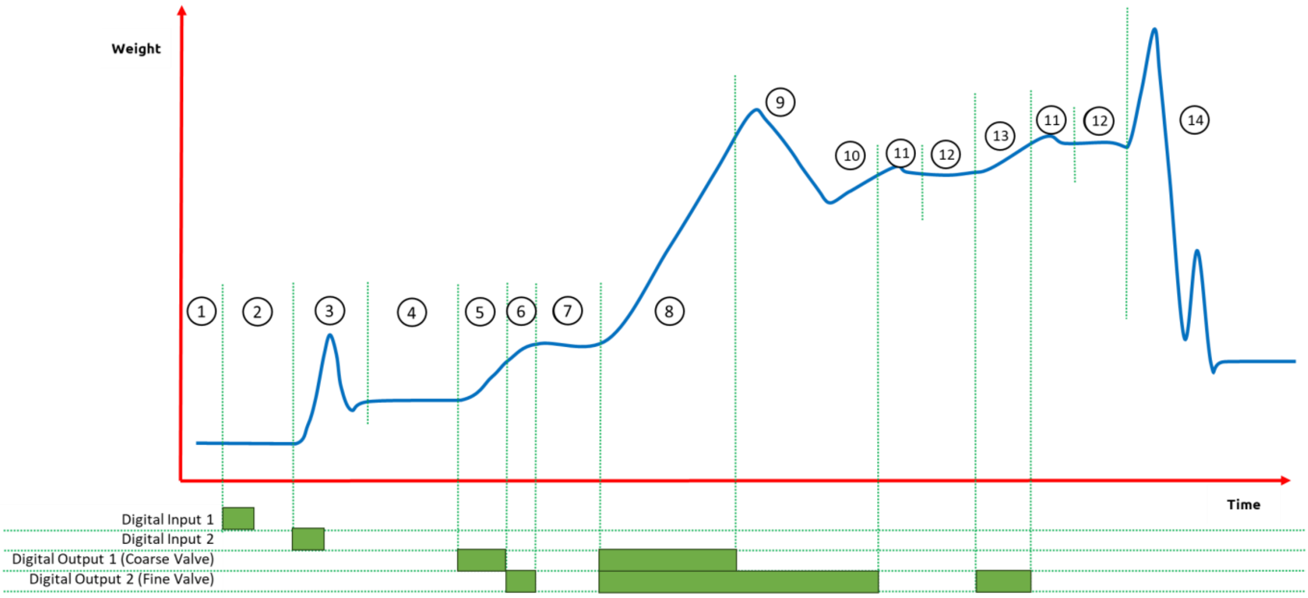
Master Sends	Slave Responds With	Meaning
TE↵	E:001	**Request:** TE=1 (Rising Edge).
TE 0↵	OK	**Setup:** TE=0 (Falling Edge).

Permitted Values: 0…1 [0=High-to-Low Transition; 1=Low-to-High Transition].

Factory Default: 1 [Rising Edge].

5.15.Filling Commands – DI, SC, AC, GD, DT, PD1 to PD21

Note: All setups should be stored with the '*SDD*' command before power-off. The filling process is controlled by the dosing parameters. The parameters are related to the sections shown in the filling cycle.



Phases:

1) Waiting for Start Trigger (*Digital Input 1*).
2) Zero Check Averaging (*PD3*).
3) Trigger 2 (*Digital Input 2* or F/W Trigger) Starts Tare Delay (*PD4*).
4) Tare Weight Averaging (*PD5*).
5) First Pre-fill – Coarse (*Digital Output 1* & *PD2*).
6) Second Pre-fill – Fine (*Digital Output 2*).
7) Delay after Pre-fill (*PD6*).
8) Coarse Filling (*Digital Outputs 1 & 2*).
9) Blanking Time after Coarse Fill (*PD7*).
10) Fine Filling (*Digital Output 2*).
11) In-flight Delay (*PD8*).
12) Dosed Weight Averaging (*PD9*).
13) Post-Filling (*Digital Output 2*).
14) Bottle Off. Filling Sequence Complete.

The parameters for the filling process are read and set through the 'Read/Modify Dose Parameter' commands. The following commands enable the setup and control of the built-in filling controller program. The program assumes that the coarse filling valve is connected to Output 1 and the fine filling valve is connected to Output 2. A rising edge on Input 1 will initiate the zero-check function of the load cell (load-cell OK) and a rising edge on Input 2 will initiate the filling cycle.

Note: See '*TR*' command for soft triggering.

PD'n' Read/Modify Dosing Parameters

Issuing the '*PD*' command with one parameter (*PD'n'*) will return the value of the n'th parameter in the format **P15+00500**. Issuing the '*PD*' command with two parameters (**PDn x**) will change the n'th parameter to the value x.

Note: In this version of software all the parameters will be set to zero by the factory default ('*FD*') command.

Filling Process

The filling process is started by a '*Start Cycle*' command '*SC*' from the gateway once the ER500 filling parameters have been loaded. Once started, the filling process can be either waiting for a trigger or be in the process of filling. While waiting for the trigger, the filling cycle can be started by a '*Trigger*' command. If a '*Trigger*' is sent while filling is in progress the ER500 will respond with a 'Not ready' message.

If '*PD5*' is not zero, the ER500 will wait '*PD4*' milliseconds before determining the tare weight by averaging the weight for '*PD5*' milliseconds. If '*PD5*' is zero a tare of zero will be used and no tare phase takes place.

If '*PD1*' is not zero the ER500 will pre-fill in the mode as set by '*PD1*' until the weight reaches '*PD13*', then a second pre-fill takes place until the weight reaches '*PD17*'. Then if '*PD6*' is not zero the ER500 will turn off the valves and wait '*PD6*' milliseconds. Then the ER500 will enter the main filling phase with both valves opened until '*PD14*' & '*PD15*', where the coarse valve will be closed and fine-filling will continue until target weight '*PD15*', where all valves are closed (if the coarse valve has been closed by external command, fine-filling will just continue anyway: the fine fill will just have started somewhat earlier).

After the filling is complete the actual dosed weight is measured by averaging the weight for '*PD9*' milliseconds, and a difference from the actual desired weight is calculated and used to fine-tune the cut-off setting for the fine-fill phase. If '*PD19*' is not zero and the dosed weight is less than the desired filling weight, then the fine filling is resumed for '*PD19*' milliseconds, then the new dosed weight is averaged. The post fill step will be repeated until the measured weight is higher than or equal to the desired filling weight. The new weight is not used in the calculation of the in-flight value. The PLC monitors the qualifier field bits (byte 16 – 17, bit 13) and ask for the dosed weight when ready.

The filling cycle can be aborted at any time. The '*AC*' command terminates the filling process completely. After that you must issue a '*SC*' command before you can trigger another filling.

Whilst any valves are open the filling rate is monitored according to which valves are open. If a direct command alters the valve state, the monitoring changes its internal control slope according to the new setting. In this way the master PLC may introduce different filling algorithms while still maintaining monitoring of the filling slope.

In the post-fill situation, the ER500 checks the weight increases.

5.15.1. DI Filling Status

Issuing the '*DI*' command will return a snapshot of the *current* status.

Master Sends	Slave Responds With	Meaning
DI↵	I:000068	**Status:** Dose Program Running, Tare Out of Range (No Filling).

This result can be decoded according to the table below:

Filling Status	Filling Status
0 Idle.	0 Idle.
1 Coarse Valve Open.	256 Waiting for 2nd Trigger.
2 Fine Valve Open.	512 Bottle On, Calculating Tare.
4 Dose Program Running.	768 Pre-Filling.
8 Not Used.	1024 Main Filling.
16 Not Used.	1280 Fine Filling.
32 Not Used.	1536 In-Flight Delay.
64 Tare Out of Range – No Filling this Cycle.	1792 Post Fill Calculation.
128 Zero Out of Range.	2048 Post Filling.

5.15.2. SC Start Cycle

Issuing the '*SC*' command without parameters, will initiate the filling cycle state machine, i.e., the '*Dosing Program Running*' status bit will be set in *Filling Status Register* '*DI*'. The program will wait for a trigger pulse on logical input 1 or 2 (or from *Software Trigger* '*TR*') to start a filling cycle measurement. If the load-cell zero-check function is not required, set '*PD3*' to '0'. The system then waits for a trigger pulse on logical input 2.

Note: The triggers (Hardware or Software) when '*SC*' has been issued will control the filling cycle state machine. To end a filling cycle the '*AC*' command will revert the Hardware or Software triggers to operate the Average Trigger '*GA*' or '*SA*'.

Factory Default: None.

5.15.3. AC Abort Cycle

Issuing the '*AC*' command (has no parameters), will abort the filling cycle immediately, i.e. the '*Dosing Program Running*' status bit will be reset, the valves will be shut off and the dosing program will stop.

Factory Default: None.

5.15.4. GD Get Last Dosed Weight

Issuing the '*GD*' command will return the last dosed weight value in the format **D+001.100**.

Master Sends	Slave Responds With	Meaning
GD↲	D+001.100	**Request:** Dosed Weight 1100 d.

Factory Default: None.

5.15.5. DT Get Last Tare Weight

Issuing the '**DT**' command will return the last tare weight value recorded by the filling program, in the format **T+000.500**.

Master Sends	Slave Responds With	Meaning
DT↲	T+000.500	**Request:** Tare Weight 500 d.

Factory Default: None.

5.15.6. PD1 Pre-Fill Mode

Secondary pre-filling modes can be added to the values of the 1st pre-filling mode.

1st Pre-Fill Modes	2nd Pre-Fill Modes
0: No Pre-Filling.	0: No Pre-Filling.
1: 1st Pre-Filling with Coarse Valve Only.	4: 2nd Pre-Filling with Coarse Valve Only.
2: 1st Pre-Filling with Fine Valve Only.	8: 2nd Pre-Filling with Fine Valve Only.
3: 1st Pre-Filling with Both Valves.	12: 2nd Pre-Filling with Both Valves.

Master Sends	Slave Responds With	Meaning
PD1↲	P1+000000	**Request:** No Pre-Filling.
PD1 2↲	OK	**Setup:** Pre-Filling with fine valve only.

Permitted Range: 0…15.

Factory Default: 0.

5.15.7. PD2 In-Flight Correction

In-flight correction factor adjustment from 0 to 50% range.

If PD2 > 0 then in-flight correction is required. PD2 is a percentage (0...50%). The difference between dosed and required weight is then multiplied by the percentage to get the in-flight correction weight.

*in-flight correction = dosed weight - target weight (PD15) * PD2*/100

This in-flight correction adjusts the fine setpoint weight which causes the fine valve to shut off sooner or later. This should bring the dosed weight closer to the required weight.

Master Sends	Slave Responds With	Meaning
PD2↵	P2+000010	**Request:** In-Flight Correction=10%.
PD2 25↵	OK	**Setup:** Set In-Flight Correction to 25%.

Permitted Range: 0...50%.

Factory Default: 0.

5.15.8. PD3 Average Time Zero Check Load-Cell

Time (in ms) during which the load-cell zero check average is calculated. By setting '***PD3***' to zero, the zero-check function of the load cell will be skipped. No pulse on input 1 required.

Master Sends	Slave Responds With	Meaning
PD3↵	P3+000200	**Request:** Zero-Check Time=200ms.
PD3 400↵	OK	**Setup:** Set Zero-Check Time to 400ms.

Permitted Range: 0...65535.

Factory Default: 0.

5.15.9. PD4 Delay Time Tare Average

The delay time (in ms) between the trigger pulse applied to logical input 1 and the start of the tare averaging period.

Master Sends	Slave Responds With	Meaning
PD4↲	P4+000200	**Request:** Delay Time=200ms.
PD4 100↲	OK	**Setup:** Set Delay Time to 100ms.

Permitted Range: 0…65535.

Factory Default: 0.

5.15.10. PD5 Average Time Tare Weight

This is the time over which the tare weight average is calculated. This function allows the correct tare value to be acquired despite possible vibrations on a (rotating) filling machine.

Master Sends	Slave Responds With	Meaning
PD5↲	P5+000300	**Request:** Tare Average Time=300ms.
PD5 250↲	OK	**Setup:** Set Tare Average Time to 250ms.

Permitted Range: 0…65535.

Factory Default: 0.

5.15.11. PD6 Delay Time After Pre-Filling

Delay time at the end of pre-filling, after valve(s) shut off.

Master Sends	Slave Responds With	Meaning
PD6↲	P6+000000	**Request:** Delay Time=0ms.
PD6 250↲	OK	**Setup:** Set Delay Time to 250ms.

Permitted Range: 0…65535.

Factory Default: 0.

5.15.12. PD7 Blanking Time After Coarse Valve Shut-Off

After the coarse valve shuts off, a weight peak may occur because of a surge or splash of the product being filled.

Master Sends	Slave Responds With	Meaning
PD7↵	P7+000100	**Request:** Blanking Time=100ms.
PD7 250↵	OK	**Setup:** Set Blanking Time to 250ms.

Permitted Range: 0…65535.

Factory Default: 0.

5.15.13. PD8 In-Flight Delay After Fine Valve Shut-Off

After the fine valve shuts off, a weight peak may occur because of a surge or splash of the product being filled.

Master Sends	Slave Responds With	Meaning
PD8↵	P8+000100	**Request:** Delay Time=100ms.
PD8 250↵	OK	**Setup:** Set Delay Time to 250ms.

Permitted Range: 0…65535.

Factory Default: 0.

5.15.14. PD9 Dosed Weight Average Time

This is the time the filled weight average is calculated. This function allows you to acquire the correct filled weight despite possible vibrations on a (rotating) filling machine.

Master Sends	Slave Responds With	Meaning
PD9↵	P9+000100	**Request:** Average Time=100ms.
PD9 500↵	OK	**Setup:** Set Average Time to 500ms.

Permitted Range: 0…65535.

Factory Default: 0.

5.15.15. PD10 Zero Tolerance

Load-cell zero tolerance check (in increments). This is the allowable deviation from the unloaded load cell zero (no bottle or box). If the unloaded load-cell zero is outside this window, the filling process will not start. This function can easily check to see if a load-cell has been over-loaded.

Master Sends	Slave Responds With	Meaning
PD10↵	P10+000100	**Request:** Load-Cell Zero Check Tol=100d.
PD10 5000↵	OK	**Setup:** Set Tolerance to 5,000d.

Example: PD10 5000 means that the zero point of unloaded load-cell must be within the window ±5,000.0g relative to the reference zero [when cal. 1 kg=10,000 increments].

Permitted Range: 0...999999.

Factory Default: 0.

5.15.16. PD11 Tare Reference Weight

Tare reference weight (in increments). This is the nominal weight of the empty bottle/box.

Master Sends	Slave Responds With	Meaning
PD11↵	P11+000400	**Request:** Tare Reference Weight=400d.
PD11 230↵	OK	**Setup:** Set Tare Reference Weight=230d.

Permitted Range: 0...999999.

Factory Default: 0.

5.15.17. PD12 Tare Weight Tolerance

Tare weight tolerance (in increments). This is the allowable deviation of the tare weight (bottle or box). If the tare weight value is outside this window the filling process will not start.

Master Sends	Slave Responds With	Meaning
PD12↵	P12+000020	**Request:** Tare Weight Tolerance=20d.
PD12 50↵	OK	**Setup:** Set Tare Weight Tolerance=50d.

Example: PD12 20 means the deviation of tare weight is 2.0g [when cal. 1kg=10,000 increments].

Permitted Range: 0...999999.

Factory Default: 0.

5.15.18. PD13 Pre-Fill Level 1st Set-Point

Pre-fill level (in increments). This is the weight value required at the end of the 1st pre-filling process.

Master Sends	Slave Responds With	Meaning
PD13↵	P13+000500	**Request:** Pre-Filling Level=500d.
PD13 750↵	OK	**Setup:** Set Pre-Filling Level=750d.

Example: PD13 750 means pre-filling with 75.0g [when cal. 1kg=10.000 increments].

Permitted Range: 0…999999.

Factory Default: 0.

5.15.19. PD14 Fine-Fill Weight

Fine-fill weight (in increments). This is the part of the total filling weight carried out by the fine filling valve.

Master Sends	Slave Responds With	Meaning
PD14↵	P14+000500	**Request:** Fine-Fill Weight=500d.
PD14 1000↵	OK	**Setup:** Set Fine-Fill Weight=1000d.

Example: PD14 1000 means fine filling with 100.0g [when cal. 1kg=10.000 increments].

Permitted Range: 0…999999.

Factory Default: 0.

5.15.20. PD15 Filling Weight

This is the target filling weight (in increments).

Master Sends	Slave Responds With	Meaning
PD15↵	P15+004000	**Request:** Filling Weight=4000d.
PD15 500↵	OK	**Setup:** Set Filling Weight=500d.

Example: PD15 500 means total filled weight is 500.0g [when cal. 1kg=10,000 increments].

Remark: Coarse filling weight is automatically calculated as the result of:

filling weight - fine filling weight - in-flight weight.

Permitted Range: 0…999999.

Factory Default: 0.

5.15.21. PD16 In-Flight Weight

In-flight weight (in increments) is the weight falling into the container after the fine valve shuts off.

Master Sends	Slave Responds With	Meaning
PD16↵	P16+000108	**Request:** In-Flight Weight=108d.
PD16 200↵	OK	**Setup:** Set In-Flight Weight=200d.

Example: PD16 108 means an In-flight weight value of 10.8g [when cal. 1kg=10,000 increments].

Note: Refer to the correction factor '*PD2*', the shut off setpoint for the fine valve will be optimized for the next filling cycle etc.

Permitted Range: 0...999999.

Factory Default: 0.

5.15.22. PD17 Pre-Fill Level – 2nd Set-Point

Pre-fill level (in increments) is the weight acquired at the end of the 2nd pre-filling process.

Master Sends	Slave Responds With	Meaning
PD17↵	P17+000550	**Request:** Pre-Fill Level=550d.
PD17 750↵	OK	**Setup:** Set Pre-Fill Level=750d.

Example: PD17 750 means a secondary pre-fill level of 75.0g [when cal. 1kg=10,000 increments].

Permitted Range: 0...999999.

Factory Default: 0.

5.15.23. PD18 Filling Timeout

The ER500 subtracts the various delays and average times ('*PD3*' to '*PD9*') from the timeout period '*PD18*' and uses the 'remaining' fill time and fill-weight to calculate a minimum filling slope. If the weight does not stay between this minimum slope and twice the minimum slope the ER500 aborts the filling cycle and reports a filling failure. The filling cycle will also be aborted if the timeout value '*PD18*' expires.

Master Sends	Slave Responds With	Meaning
PD18↵	P18+002000	Request: Timeout=2000ms.
PD18 3000↵	OK	Setup: Set Timeout=3000ms.

Note: If PD18=0, the timeout is disabled.

Permitted Range: 0…65535.

Factory Default: 0.

5.15.24. PD19 Underweight Post-Fill Time

If the averaged dosed value is less than the required weight this parameter controls the post fill time in milliseconds. After post-filling, the dosed weight is recalculated. If this parameter is zero, no post filling occurs.

Master Sends	Slave Responds With	Meaning
PD19↵	P19+000080	Request: Post-Fill Time=80ms.
PD19 100↵	OK	Setup: Set Post-Fill Time=100ms.

Note: If PD19=0, the post-filling is disabled.

Permitted Range: 0…65535.

Factory Default: 0.

5.15.25. PD20 Tare Interval

In some cases where the object being filled is not a new bottle but a box that is being emptied after each fill, the tare function is not necessary in every filling cycle. When '***PD20***' is zero, taring only takes place in the very first filling cycle. When '***PD20***' is 1 (one, default) the taring takes place in every filling cycle. Otherwise, '***PD20***' can be set to the number of filling cycles which must occur before a tare measurement is taken again.

Master Sends	Slave Responds With	Meaning
PD20↵	P20+000001	Request: Tare each Filling Cycle.
PD20 100↵	OK	Setup: Set Tare at Each 100th Filling Cycle.

Example: PD20 100, means next tare after 100 filling processes.

Permitted Range: 0…999999.

Factory Default: 1.

5.15.26. PD21 Pre-Fill Coarse Valve Blanking

The control of the filling slope is disabled for '***PD21***' milli-seconds from opening the coarse valve to allow for oscillation in the weight during the first part of the coarse pre-fill.

Master Sends	Slave Responds With	Meaning
PD21↵	P21+000200	Filling Slope Disabled for 200ms.
PD21 500↵	OK	Setup: Set Filling Slope Disabled for 500ms.

If PD21 >0 this will initiate the pre-fill coarse valve blanking. When the coarse valve is first turned on, it can cause the weight to oscillate. If PD18 >0 the flow rate will be monitored and if it goes outside tolerance, it will abort the cycle.

Permitted Range: 0…65535.

Factory Default: 0.

6. Status Codes

6.1. Error Codes

Front Panel Error Codes.

Err 1	Incompatible Firmware Installed.
Err 2	Zero Out of Zero Range. Attempting to set ≥2% of *CM'n'*.
Err 3	Input Exceeds ±6.0mV/V.
Err 4	Input Exceeds ±3.3mV/V.
Err 5	Load-Cell Connection Failure.
Err 6	Not Used.
Err 7	Requested Value '*Out-of-Range*'.
------	Zero or Tare Limit Exceeded.
______	Load-Cell Input Underload.
‾‾‾‾‾‾	Load-Cell Input Overload.

6.2. Fault Codes

During power-up, the ER500 will run self-check diagnostics on its internal functionality. There are no prerequisites e.g., external connections or test modes for this diagnostic check to complete. The purpose for the test is to confirm the hardware condition. It does not confirm the status of communication protocols. This feature is available to run during normal operation from the command line with the '*SELF*' command.

During power-up, the diagnostics will perform a self-check test. The front panel will display the result of the diagnostics, either pass ('*Good*') or fail ('*Bad*'). If passed, the '*Good*' will disappear and will proceed to normal operation. Should an issue be detected, the '*Bad*' message will appear on the display, followed shortly by the fault code(s) detected e.g.

Fault Code	Displayed	Circuit	Description
1	F-001	+Vdcdc Rail	Under-Voltage
2	F-002	+Display Rail	Under-Voltage
3	F-003	+Analog Rail	Under-Voltage
4	F-004	+3.3V_PHY Rail	Under-Voltage
5	F-005	+3.3V_Comms Rail	Under-Voltage
6	F-006	+5V_Comms Rail	Under-Voltage
7	F-007	ADC SPI Comms	Comms Failure
8	F-008	I^2C Comms	Comms Failure
9	F-009	IPC Comms	Comms Failure
10	F-010	DAC SPI Comms	Comms Failure
11	F-011	PHY MII Comms	Comms Failure
12	F-012	+Vdcdc Rail	Over-Voltage
13	F-013	+Display Rail	Over-Voltage
14	F-014	+Analog Rail	Over-Voltage
15	F-015	+3.3V_PHY Rail	Over-Voltage
16	F-016	+3.3V_Comms Rail	Over-Voltage
17	F-017	+5V_Comms Rail	Over-Voltage

7. Approved Applications

The term '*Approved*' applies whenever the weighing application is intended to be used for '*legal-for-trade*' weighing – that is, trade transactions and certain medical applications. Such applications are bound by the legal metrology regulations of the relevant governments around the world, most countries will comply with either the relevant ENs (Euro Norms) or the relevant OIML (*Organisation Internationale de Métrologie Légale*) recommendations.
The ER500 has been approved as a component for use in weighing systems according to OIML recommendation R61, the highest performance level approved being Class III, 10,000 intervals (e) and n x 10,000 intervals (n=2, 3). The notified approval body is the Danish Electronics, Light & Acoustics (DELTA/Force).
This approval will allow the use in approved weighing systems throughout Europe and in many other countries of the World. To achieve approval for an 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, discussions with the appropriate 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.

7.1. Restrictions in Approved Applications

A variety of performance restrictions must come into force. These restrictions are the number of display divisions, which become limited to 10,000 divisions and the sensitivity per display division which becomes 0.2µV per division. Once installed in the application, an '*approved*' application will require '*stamping*' by an officer of the relevant governmental department. This certifies the equipment or system as being in accordance to relevant regulations and within calibration limits.

7.2. The Traceable Access Code (TAC)

The user software must then provide a guard against improper access of the calibration commands (see '*Calibration Commands*' section). The ER500 features the '*Traceable Access Code*' or TAC method of controlling the access to the calibration commands group. This means 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*' (verification) test, the appropriate officer will make a note of the TAC value 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.

Where Quality Meets Precision

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