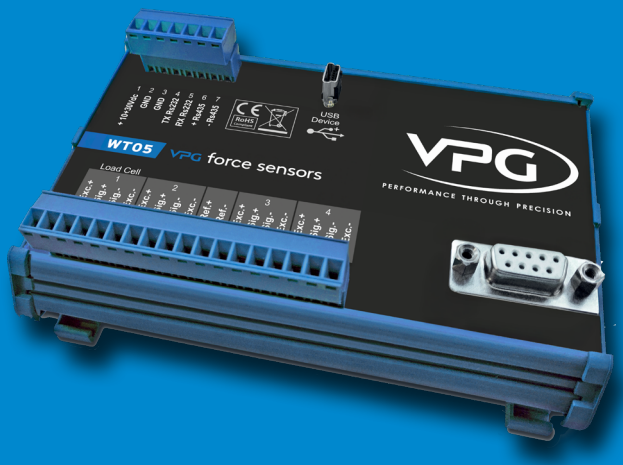
WT 05

SERIAL AND ANALOG WEIGHING INDICATOR/TRANSMITTER

Technical manual

Software version WT0501_12



VPG force sensors

Celtron ▪ Revere ▪ Sensortronics ▪ Tedea-Huntleigh

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PRECAUTIONS

***READ** this manual **BEFORE** using or maintaining the load cells.*

***FOLLOW** these instructions carefully.*

***KEEP** this manual for future reference.*

WARNING

Installation and maintenance of this device should only be performed by qualified personnel.

Exercise caution when conducting inspections, tests, and adjustments while the device is powered on.

Perform electrical connections only when the power supply is disconnected.

Failure to observe these precautions may result in hazards.

***DO NOT** allow untrained personnel to operate, clean, inspect, repair, or tamper with these load cells.*

TECHNICAL FEATURES

PARAMETER	VALUE
Power Supply	12÷24 VDC ± 15%
Maximum Power Consumption	5 W
Insulation	Class III
Installation Category	Cat. II
Operating Temperature	-10°C ÷ +50°C (14 °F ÷ 122 °F) (max humidity 85% without condensation)
Storage Temperature	-20°C ÷ +70°C (–4 °F ÷ 158 °F)
Overall Dimensions	98 x 90 x 40 mm (3.86 x 3.54 1.57 in) (W x H x D)
Mounting	On DIN rail or OMEGA bar support
Enclosure Material	Self-extinguishing Noryl (UL 94 V1)
Connections	Removable screw terminals, 3.81 mm (0.15 in) pitch
Load Cell Power Supply	5 VDC (max 16 cells of 350Ω)
Input Sensitivity	0.02 µV min.
Linearity	< 0.01% of full scale
Temperature Drift	< 0.0003% of full scale / °C
A/D Converter	24-bit
Internal Resolution	> 8,000,000 points
Measurement Range	From -3.9 mV/V to +3.9 mV/V
Weight Acquisition Frequency	25 ÷ 400 Hz (4 cells)
Digital Filter	Selectable 0.25 ÷ 25 Hz
Serial Ports	1 USB device + 1 RS232C + 1 RS485
Maximum Cable Length	15m (49.21 ft) (RS232C), 1000m (3280.84 ft) (RS422 and RS485)
Serial Protocols	ASCII, Modbus RTU
Baud Rate	Selectable: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
USB Device Port	USB 2.0 compliant, speeds up to 12 Mbps
Microcontroller	32-bit ARM Cortex M0+, 128 KB Flash reprogrammable via USB onboard
Data Memory	4 Kbytes
Fieldbus (alternative to RS485)	PROFINET, ETHERNET IP, ETHERCAT, ETHERNET, PROFIBUS DP, CANOPEN
Compliance with Standards	EN61000-6-2, EN61000-6-3, EN61010-1

INTRODUCTION

The device is a precision transmitter for weighing and force measurement systems that use load cells. It allows for the acquisition of analog load cells separately (**up to a maximum of 8 cells**).

The device converts the **mV** signal from the load cells into a high-resolution digital signal (**24 bits**) for each individual cell. The sum of the points provides a more precise measurement of the acquired weight.

The transmitter can be integrated as a slave into various network types through different Serial or Fieldbus communication protocols.

Common analog load cells are connected to the transmitter instead of expensive digital cells.

This combination offers the following advantages:

1. Independent acquisition of the **mV/V** output and the weight value of each individual cell.

2. Monitoring of all load cells and generation of alarms in case of excessive signal drift, connection failures, or cell malfunctions.

STATUS LED

LED	Status	Description
🟢	**Flash 0.5 sec**	Normal Operation
🟠	**Flash 0.5 sec**	No fieldbus connection (Only if a Fieldbus is present)
🔴	**Steady**	Fieldbus error (Only if a Fieldbus is present)
🔴	**Index flash**	Cell error (The number of flashes "indicates" the cell in error)
🟢	**Fast flash**	Boot loader activated

WEIGHING SYSTEM CONNECTION DIAGRAM

Main Components:

- **WT 05:** Main module with connectors for load cells.
- **WT 05 connections:** Communication module with network ports.

Input Connections:

- **MT1, MT2, MT3:** Connectors for weight sensors (load cells).
- **USB:** Communication port for programming or diagnostics.

Output Connections:

- **Serial Interfaces:** Connects the system to remote displays.
- **Fieldbus:** Connection to PLC and computer for monitoring and management.

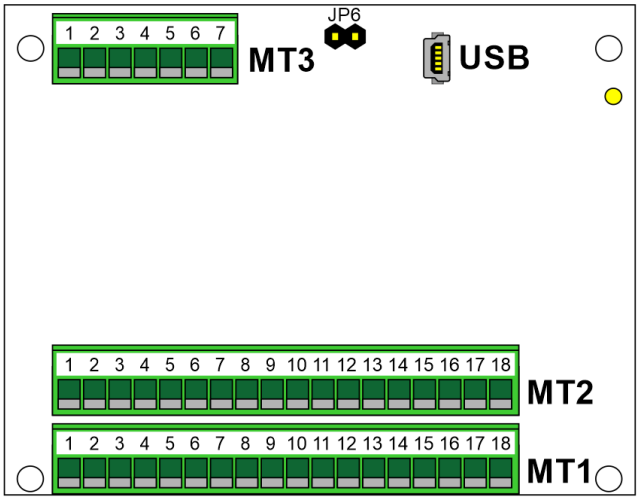
Connected Devices:

- **Remote Display:** Shows the measured weight.
- **PLC:** For industrial automation and data management.
- **Computer:** Interface for software control and data analysis.

Applications:

- Floor scales / Weighing systems for trucks / Weighing systems for silos and tanks.

POWER, SERIAL, USB AND LOAD CELL CONNECTIONS



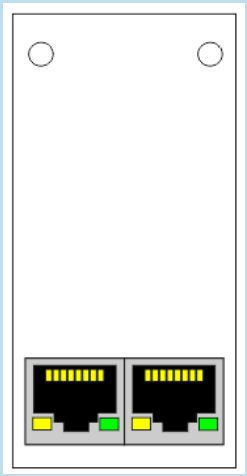
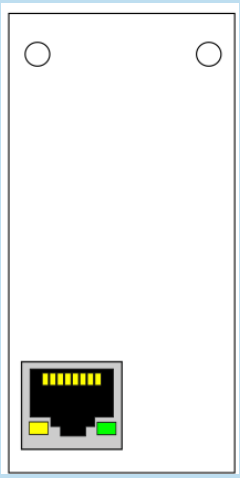
MT1 (Cells 1-4)	
1	+ Power (5V)
2	+ Cell Signal 1
3	- Cell Signal 1
4	GND
5	+ Power (5V)
6	+ Cell Signal 2
7	- Cell Signal 2
8	GND
9	+ Reference (C1-C4)
10	- Reference (C1-C4)
11	+ Power (5V)
12	+ Cell Signal 3
13	- Cell Signal 3
14	GND
15	+ Power (5V)
16	+ Cell Signal 4
17	- Cell Signal 4
18	GND

MT2 (Cells 5-8)	
1	+ Power (5V)
2	+ Signal Cell 5
3	- Signal Cell 5
4	GND
5	+ Power (5V)
6	+ Signal Cell 6
7	- Signal Cell 6
8	GND
9	+ Reference (C5-C8)
10	- Reference (C5-C8)
11	+ Power (5V)
12	+ Signal Cell 7
13	- Signal Cell 7
14	GND
15	+ Power (5V)
16	+ Signal Cell 8
17	- Signal Cell 8
18	GND

MT3 (Power / Serial)	
1	+ 12/24 Vdc
2	GND
3	GND
4	TX RS232
5	RX RS232
6	+ RS485
7	- RS485

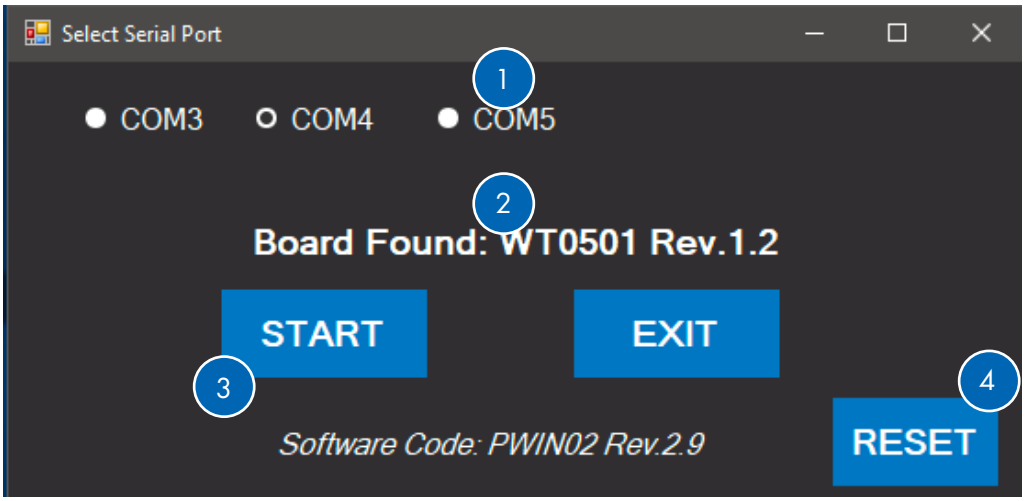
If the cells used have 4 wires, make a jumper between Power Supply + and Reference +, and between Power Supply – and Reference -.

FIELDBUS CONNECTIONS

Fieldbus	Ethernet	
		Additional card for **Fieldbus** (Profinet, EtherCAT, Ethernet-IP) and **Ethernet** connections.
Profibus	**CanOpen**	
		Additional card for **Profibus** and **CanOpen** connections.

INSTRUMENT CONFIGURATION

To configure this device, the PC software "PWIN02" must be used. This program allows users to set various weighing and serial communication parameters, as described in the following pages.



INTERFACE ELEMENTS:

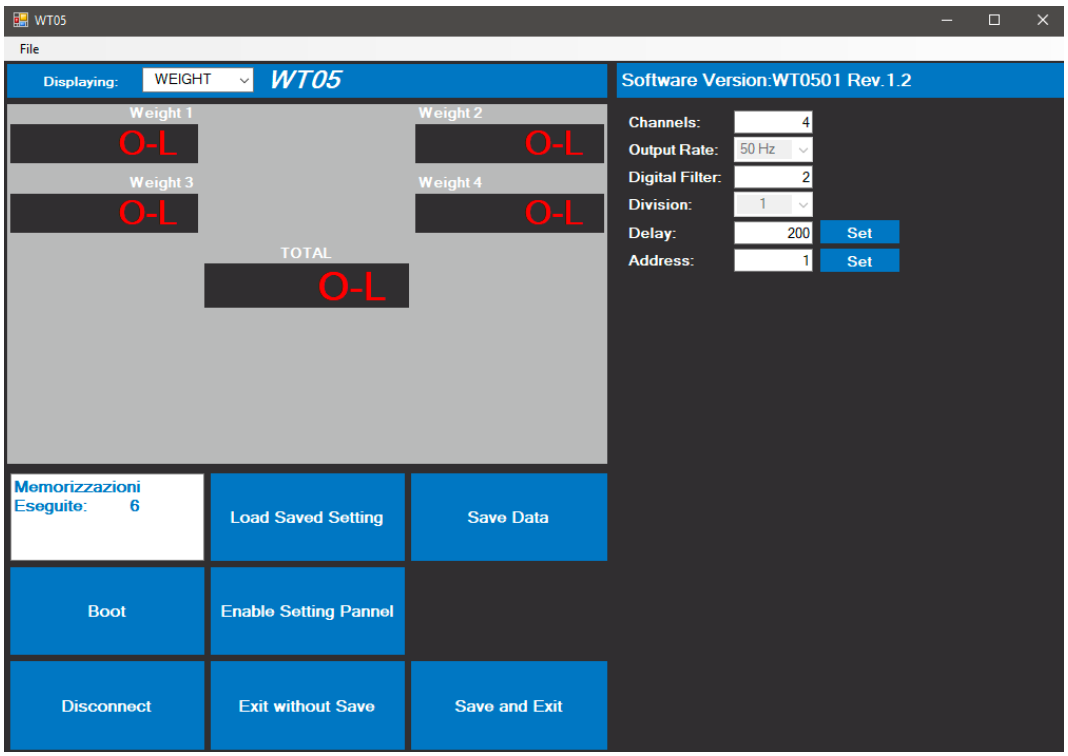
1 *• **PC COM** Port to which the **WT 05** is connected.*
2 *• Message identifying the connected **WT 05** on the **PC**.*
3 *• Button to access the **WT 05** configuration screen.*
4 *• Button to reset **WT 05** parameters.*

CONFIGURATION STEPS:

- First, connect the **WT 05** to the PC via **RS232** or **USB**.
- The connection with the PC configurator is established at a baud rate of **38400 baud**.
- Start the program, and the configuration screen will appear.
- Select the **COM** port to which the device is connected and wait for the software to recognize the WT05.
- Once recognized, the message "**Board Foun**d" will appear, indicating the installed firmware.
- Press the **START** button to begin configuring the **WT 05**.

Additionally, you can reset all **WT 05** configuration parameters by pressing the **RESET** button.
A confirmation message will appear before proceeding with the reset.

To exit the application, press the **EXIT** button or click the **X** in the top-right corner of the window.



Once the configuration starts, the indicated screen will appear, allowing you to set weighing parameters, communication settings, and calibrate the connected load cells.

MAIN FEATURES OF THE CONFIGURATION SCREEN:

• In the **top left corner**, you can view the measured value for each individual cell (selectable as weight/points/signal from a drop-down menu). The totalized weight in kg/points for all connected cells is also displayed.

• The **bottom left section** contains buttons for various operations, such as saving the **WT 05** configuration data to a file, enabling parameter modifications, performing cell calibration, or setting the device into **BOOT** mode.

CONFIGURABLE PARAMETERS:

After pressing the "Enable Setting Panel" button, you can modify the parameters displayed in the top right section:

• **Channels**: Number of currently enabled channels (from 1 to 8).

• **Output Rate (Hz)**: The current weight acquisition frequency, selectable between 50 Hz, 100 Hz, 200 Hz, 400 Hz, and 800 Hz (reference value for 4 cells).

• **Digital Filter**: The currently set digital filter, with values ranging from **0** to **9**.

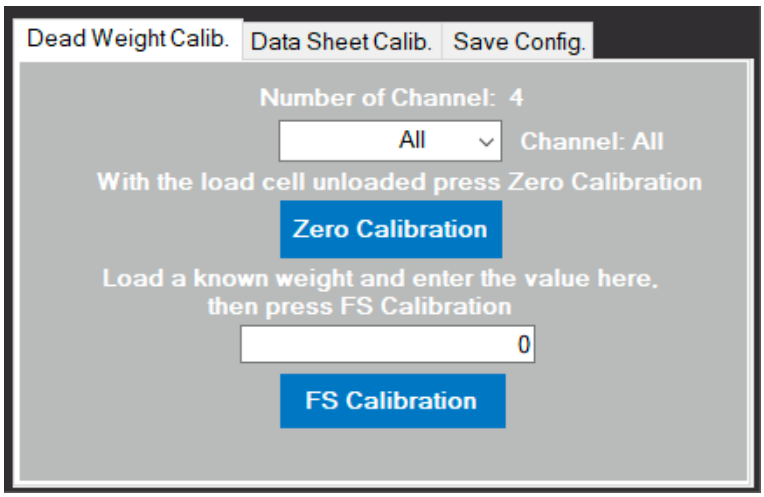
• **Display Division**: The number of divisions currently set, with a minimum of **0.0001** and a maximum of 5**0**.

• **Address (1-255)**: The instrument's address for the available/active communication protocols.

Note: Parameters highlighted in red can only be modified after enabling the "Setting Panel" by pressing the "Enable Setting Panel " button."

SAMPLE WEIGHT CALIBRATION

This first window allows for the calibration of the load cells using a sample weight.



First, select whether to calibrate a specific cell or all cells simultaneously using the drop-down menu.

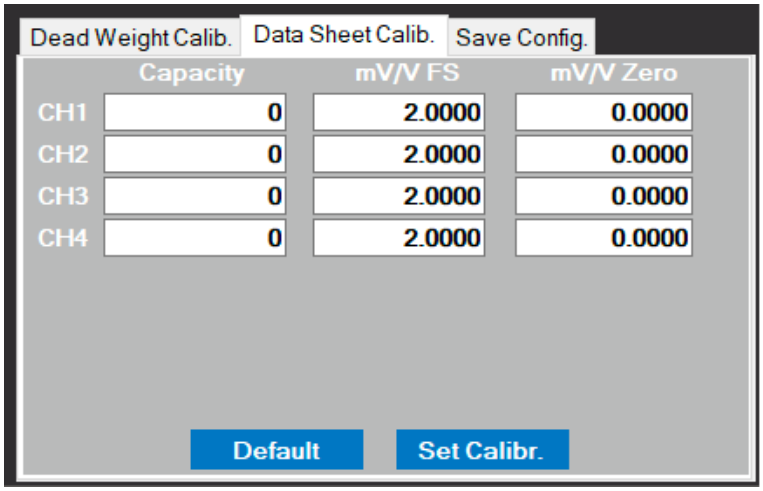
To perform zero calibration, ensure the cells are unloaded and press the **ZERO CALIBRATION** button.

For full-scale calibration, place a known weight on the cells, enter its value (**in kg**) in the **F.S.** text box, and press **FS CALIBRATION** to calibrate the channels.

SETTING THE MAXIMUM LOAD FOR EACH CELL

In the second window, you can set the **maximum load capacity and the maximum signal value** for each connected cell. These values are used by the device to calibrate each enabled channel.

- You can also specify a **signal value corresponding to zero**.
- Once all parameters are entered, press **Set Calibr.** to execute the calibration.

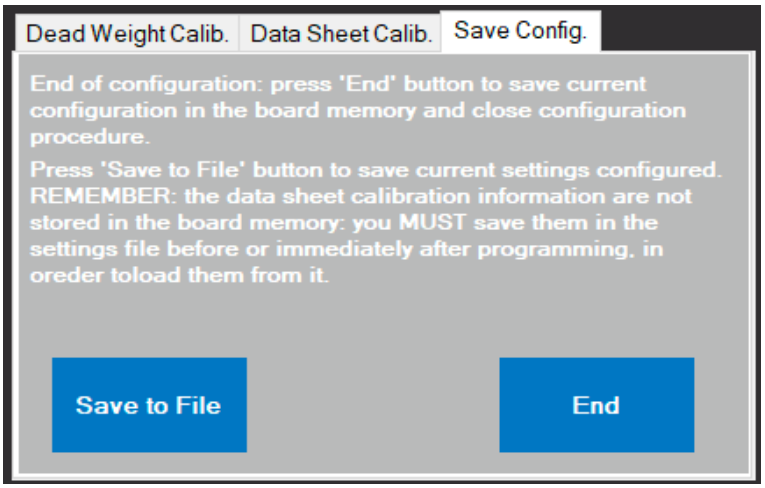


SAVING THE CONFIGURATION

This submenu allows saving the configuration parameters to the device.

Press **END** to send a save command to the device.

Press **SAVE TO FILE** to store the configuration in a text file, which can be applied to multiple devices without manually setting each parameter.



ONCE THE CONFIGURATION FILE IS SAVED:

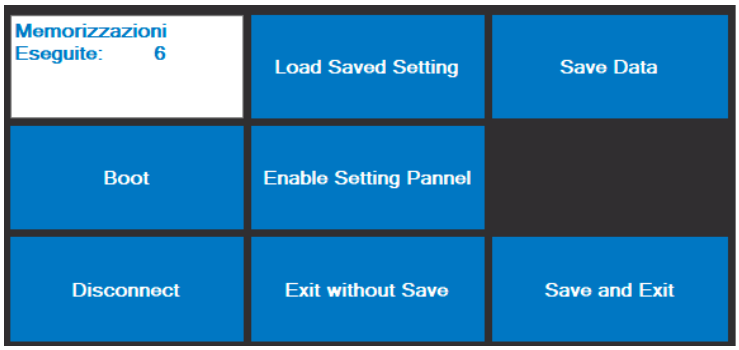
1. Press **LOAD SAVED SETTING** to open a file explorer window.

2. Locate the configuration file, select it, and click **OPEN**.

3. The parameters will be automatically read and sent to the device.

At the end of the process, a notification will confirm the operation's success.

If an **error or timeout** occurs, the procedure will stop, and an error message will be displayed.



RS485 PROTOCOL

To modify the communication protocol on the RS485 serial interface, use the "Compatibility" selection with the following modes:

COMPATIBILITY MODE	RS232 Protocol	RS485 Protocol
Continua	Continua Protocol	Modbus RTU Protocol
PDT404	SLAVE ASCII Protocol Pr.04	SLAVE ASCII Protocol Pr.04
PDT409	SLAVE ASCII Protocol Pr.09	Modbus RTU Protocol

SLAVE PROTOCOL (RS232)

The device connected to the transmitter (**typically a PC**) functions as the **MASTER** and is the only unit that can initiate communication.

The communication procedure always consists of a request from the **MASTER** followed by a response from the addressed **SLAVE**.

Both **RS232** and **RS485** ports operate at a fixed baud rate of **38400 Baud**.

COMMAND FORMAT DESCRIPTION

- Constant characters are enclosed in double quotes (**" "**), and case sensitivity is required.
- Variable numeric fields are indicated with angle brackets **< >**.
- The checksum field **(<ck>)** is calculated using the exclusive **OR (XOR)** operation on all characters between **STX (or <Ind>)** and **ETX**, excluding **STX** and **ETX** themselves.
- The **XOR** result is then split into two characters by separating the upper **4 bits** (first character) and the lower 4 bits (second character).
- These two characters are then encoded in **ASCII**.

Example:

If the **XOR** result is **5Dh**, the checksum **<csum>** will be "**5Dh**", which corresponds to **ASCII** values **35h and 44h**.

LIST OF AVAILABLE COMMANDS:

1	Boot		
PC:	STX "BOOT" EOT		
WT 05:	STX ACK EOT (ok)v	**Otherwise**	STX NAK EOT (error)

2	Temperature Reading		
PC:	STX "T" EOT		
WT 05:	STX T <ggg> ETX <ck> EOT	**Otherwise**	**<ggg>** it is the temperature in degrees

WARNING: The data programmed with the following configuration commands is not stored directly but must be confirmed with the "store programmed data" command before turning off the board.

3	Channel Number Programming		
PC:	STX C <n> EOT	**Where**	**<n>** Indicate the number of channels to use.
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)

4	Output Rate Programming		
PC:	STX R <n> EOT	**Where**	**<n>** Indicate the output rate value as per the following table.
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)

<N>	Output rate	Reference
0	12.5 Hz	50 Hz
1	25 Hz	100 Hz
2	50 Hz	200 Hz
3	100 Hz	400 Hz
4	200 Hz	800 Hz
5	0.7 Hz	3 Hz
6	1.25 Hz	5 Hz
7	2.5 Hz	10 Hz
8	5 Hz	20 Hz
9	10 Hz	40 Hz

The output rate refers to the conversion speed of a single cell. Internally, if there are, for example, **4** cells, the conversion speed will become **4** times faster.

Filters from **5** to **9** are LowPass filters and filter out the **50/60Hz** frequencies of the electrical network.

5	**Digital Filter Programming**		
PC:	STX F <n> EOT	**Where**	**<n>** Indicate the filter value to use on the weight.
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)

In the following table, the output frequency of the weight after the digital filter is displayed (depending on the conversion frequency).

<n>	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
12.5Hz	6.25Hz	4Hz	2.5Hz	1.8Hz	1.4Hz	0.8Hz	0.6Hz	0.4Hz	0.35Hz	0.25Hz
25Hz	12.5Hz	8Hz	5Hz	3.6Hz	2.8Hz	1.6Hz	1.2Hz	0.8Hz	0.7Hz	0.5Hz
50Hz	25Hz	16Hz	10Hz	7.2Hz	5.6Hz	3.2Hz	2.4Hz	1.6Hz	1.4Hz	1Hz
100Hz	50Hz	32Hz	20Hz	14.4Hz	11.2Hz	6.4Hz	4.8Hz	3.3Hz	2.8Hz	2Hz
200Hz	100Hz	64Hz	40Hz	28.8Hz	22.4Hz	12.8Hz	9.6Hz	6.6Hz	5.6Hz	4Hz
0.7Hz	0.7Hz	0.35Hz	0.23Hz	0.175Hz	0.14Hz	0.12Hz	0.1Hz	0.09Hz	0.08Hz	0.07Hz
1.25Hz	1.25Hz	0.62Hz	0.42Hz	0.31Hz	0.25Hz	0.21Hz	0.18Hz	0.16Hz	0.14Hz	0.12Hz
2.5Hz	2.5Hz	1.2Hz	0.84Hz	0.62Hz	0.5Hz	0.42Hz	0.36Hz	0.32Hz	0.28Hz	0.24Hz
5Hz	5Hz	2.5Hz	1.67Hz	1.25Hz	1Hz	0.8Hz	0.7Hz	0.62Hz	0.56Hz	0.5Hz
10Hz	10Hz	5Hz	3.3Hz	2.5Hz	2Hz	1.67Hz	1.43Hz	1.25Hz	1.1Hz	1Hz

6	**Zero Calibration**		
PC:	STX "Z" <n> <nV/V> EOT	**Where**	**<n>** Indicate the cell number, and <nV/V> is an 8-character field representing the theoretical value in nV/V (1,000,000 nanovolts = 1 volt) corresponding to zero. If this value is 0, the current signal of the channel is taken as the zero calibration (real zero calibration).
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)

7	Full-Scale Calibration		
PC:	STX "S" <n> <nV/V> <Value>EOT	**Where**	**<n>** indicates the cell number, and <nV/V> is an 8-character field representing the theoretical value in nV/V (1,000,000 nanovolts = 1 volt) corresponding to the programmed value. If this value is 0, the current signal of the channel is taken as the full-scale calibration (real full-scale calibration). **<value> =** An 8-character field representing the integer weight value corresponding to the specified signal. This value cannot exceed the signal expressed in nV/V.
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)

8	Division Value Programming		
PC:	STX "D" <vd> EOT	**Where**	**<nn>** Indicate the table index of the division value to be used.
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)

<vd>	**"00"**	**"01"**	**"02"**	**"03"**	**"04"**	**"05"**	**"06"**	**"07"**	**"08"**
Division	0.0001	0.0002	0.0005	0.001	0.002	0.005	0.01	0.02	0.05

<vd>	**"09"**	**"10"**	**"11"**	**"12"**	**"13"**	**"14"**	**"15"**	**"16"**	**"17"**
Division	0.1	0.2	0.5	1	2	5	10	20	50

9	Reading of Programmable Data		
PC:	STX "L" EOT	**Where**	• **<n>, <r>, <f> =** 3 characters in total representing the number of channels, output rate, and digital filter. • **<vd> =** 2 characters corresponding to the division value as per the illustrated coding. • **<add> =** 3 characters corresponding to the RS485 serial port address**.** • **<b>, <p> =** 2 characters in total for baud rate and RS485 protocol.
WT 05:	STX "L" <n> <r> <f> <vd> <add> <b> <p> ETX <ck> EOT		

10	RS485 Address Programming		
PC:	STX "I" <a> EOT	**Where**	**<addr>** is a character expressed in decimal (addresses accepted from 1 to 255). Example: to set the address to 60, send the string STX I chr(60) EOT. The new address is only applied after sending the 'E' command for storing programmed data.
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)

11	Default Calibration Reset		
PC:	STX "X" <n> EOT	**Where**	**<n>** indicates the channel number to be reset. This operation restores the default calibration: 0 = 0mV/V, 2,000,000 = 2mV/V.
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)

12	Storing Programmed Data		
PC:	STX "E" EOT	**Where**	With this operation, the programmed data is permanently stored in a secure non-volatile memory, but with a limited number of write cycles (≥ 10,000).
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)

13	Programmed Data Storage		
PC:	STX "N" EOT	**Where**	**<values>** is a character string containing the calibrated and filtered values of the active channels (from the 1st to the nth). Each field consists of 8 right-justified characters. These values are filtered according to the programmed digital filter. **<Status> =** weight status **<ErrorCells> =** Cells in error
WT 05:	STX"N"<values> <Status><ErrorCells> ETX <ck> EOT		

14	ADC Points Reading Channels		
PC:	STX "P" EOT	**Where**	**<points>** is a character string containing the ADC point values of the active channels (from the 1st to the nth). Each field consists of 8 right-justified characters. These values are not filtered. The point value ranges from 0 (corresponding to approximately -5.2mV/V) to 16,777,215 (corresponding to approximately +5.2mV/V).
WT 05:	STX "P" <points> ETX <ck> EOT		

15	Reading mV/V Signals of the Channels		
PC:	STX "M" EOT	**Where**	**<mV/V>** is a character string containing the mV/V signal values of the active channels (from the 1st to the nth). Each field consists of 8 right-justified characters. The values are expressed in mV/V with 4 decimal places (ranging from approximately -5.2000 mV/V to approximately 5.2000 mV/V).
WT 05:	STX "M" < mV/V > ETX <ck> EOT		

16	Firmware Version Reading		
PC:	STX "V" EOT	**Where**	**<version>** is a 16-character string containing the code and version of the firmware installed on the board.
WT 05:	STX "V" <version> ETX <ck> EOT		

17	Memory Reset Command		
PC:	STX "RESET" EOT		
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)
The device performs a memory reset, restoring all data to factory settings.			

18	Reading IP Address and Subnet Mask		
PC:	STX "t" EOT	**Where**	**<addr IP>** is a 4-character string containing the IP address values (e.g., for IP address 192.168.0.100, the field will consist of the following hexadecimal values: 0xC0, 0xA8, 0x00, 0x64). **<sub mask>** is a 4-character string containing the subnet mask values (e.g., for subnet mask 255.255.255.0, the field will consist of the following hexadecimal values: 0xFF, 0xFF, 0xFF, 0x00).
WT 05:	STX "t" <addr IP> <sub mask> ETX <ck> EOT		

19	IP Address and Subnet Mask Programming		
PC:	STX "t" <addr IP> <sub mask> ETX <ck> EOT	**Where**	**<addr IP>** and **<sub mask>** are the same as in the read command (see 't' command above).
WT 05:	STX ACK EOT (ok)	**Otherwise**	STX NAK EOT (error)

20	Read Stored Count Command		
PC:	STX "J" EOT	**Where**	**<counter>** is an 8-character string containing the memory write count of the device.
WT 05:	STX "J" <counter> ETX <ck> EOT		

21	Read COM2 Data Format Command		
PC:	STX "a" EOT	**Where**	**<index>** is a value ranging from 0 to 3: 0 = "8/N/1; 1 = "8/N/2"; 2 = "8/E/1"; 3 = "8/O/1".
WT 05:	STX "a" <index> ETX <ck> EOT		

22	COM2 Data Format and Programming Command		
PC:	STX "f" <index> EOT	**Where**	**<index>** is a value between 0x30 and 0x33: 0 = "8/N/1; 1 = "8/N/2"; 2 = "8/E/1"; 3 = "8/O/1".
WT 05:	STX ACK EOT		

23	Default Points Calibration Command		
PC:	STX "O" <type> EOT	**Where**	**<type>** is a value between 0x31 and 0x32: **1 =** Calibration 50,000-250,000; **Otherwise, 2 =** Calibration 1,000,000-3,000,000.
WT 05:	STX ACK EOT		

CONTINUOUS TRANSMISSION PROTOCOL

The instrument transmits processed load cell data at the conversion frequency. If the transmission rate is too fast, it will be limited to the maximum possible frequency based on the configured baud rate.

TRANSMITTED STRING FORMAT:

WT 05	**STX <Status> <valori>**	**ETX <ck> EOT**

Where:

<status> : A coded character according to the table below (bit = 1 if the condition is true).

<valori> = 8 ASCII characters representing the weight for each selected load cell (max 8 cells).

<ck> = aracter checksum.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	1	1	Underload	Emulated Cell	Zero Band	Stable Weight

STATUS BIT DESCRIPTIONS:

0x0001 = Stable Weight --> The weight is in a stable condition.
0x0002 = Zero Band --> The weight is within the zero band.
0x0004 = Emulated Cell --> A load cell is broken, and emulation is being used.
0x0008 = Underload --> The load cell has a negative value.
0x0010 = Fixed to 1.
0x0020 = Fixed to 1.
0x0040 = Fixed to 0.
0x0080 = Fixed to 0.

This protocol ensures continuous and real-time weight data transmission while maintaining system integrity.

MODBUS COMMUNICATION PROTOCOL

The instrument parameters that can be read or programmed through the available communication interfaces, depending on the hardware configuration, are listed in the following table.

Registers of type **R** are readable, while registers of type **W** are writable.

If the **ETHERNET** option is available, the "**MODBUS TCP**" protocol can be used with the same registers. The **ETHERNET** settings (IP, subnet, gateway, and protocol) are configured through the "**PWIN33**" PC software.

REGISTERS FOR MODBUS RTU PROTOCOL UP TO 4 CHANNELS

MODBUS Address	Holding Register	R/W	Note
0001	Status Register	R	See related table.
0002	Total Weight (MSW)	R	INT. Value - Most significant word
0003	Total Weight (LSW)	R	INT. Value - Least significant word
0004	Channel 1 Weight	R	INT. Value - Divisions
0005	Channel 2 Weight	R	INT. Value - Divisions
0006	Channel 3 Weight	R	INT. Value - Divisions
0007	Channel 4 Weight	R	INT. Value - Divisions
0008	Filter	R/W	Value from 0 to 9
0009	Average Sensitivity	R/W	Average cell sensitivity value max. 40000 uV/V
0010	Cell Range (MSW)	R/W	INT. Value - Most significant word
0011	Cell Range (LSW)	R/W	INT. Value - Least significant word
0012	Number of Channels	R/W	Value from 1 to 8
0013	Reference Division Value	R/W	See related table.
0014	Cell Situation	R	See related table.
0015	Profibus Address	R/W	Value from 1 to 255
0016	Release Firmware	R	Application version
0017	Canbus Baud Rate	R/W	Value from 0 to 7
0030	Data Register (MSW)	W	INT. Value - Most significant word
0031	Data Register (LSW)	W	INT. Value - Least significant word
0032	Command Register	W	See related table

<status register> : character encoded as per the following table (bit = 1 if the condition is true).

Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Flag Memory	0	0	0	Weight Error	OverLoad	Underload	Cell Emulated	Zero Band	Weight Stable

0x0001 = Stable Weight = The weight is in a stable condition

0x0002 = Zero Band = The weight is within the zero band

0x0004 = Emulated Cell = A cell is broken and is using emulation to function properly

0x0008 = Underload = Cell in negative value

0x0010 = Overload = Cell overloaded beyond capacity

0x0020 = Weight Error = Error in acquiring the weight value

0x0100 = Flag Memory = if it is 1 some parameters have not been stored (used only in ASCII transmission)

Cells Situation	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Meaning
0000	0	0	0	0	0	0	0	0	No error
0001	0	0	0	0	0	0	0	1	Cell 1 fault
0002	0	0	0	0	0	0	1	0	Cell 2 fault
0004	0	0	0	0	0	1	0	0	Cell 3 fault
0008	0	0	0	0	1	0	0	0	Cell 4 fault
0010	0	0	0	1	0	0	0	0	Cell 5 fault
0020	0	0	1	0	0	0	0	0	Cell 6 fault
0040	0	1	0	0	0	0	0	0	Cell 7 fault
0080	1	0	0	0	0	0	0	0	Cell 8 fault

	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8	
0100	0	0	0	0	0	0	0	1	ADC1 Timeout
0200	0	0	0	0	0	0	1	0	ADC1 No Reference
0400	0	0	0	0	0	1	0	0	ADC2 Timeout
0800	0	0	0	0	1	0	0	0	ADC2 No Reference

REGISTERS FOR MODBUS RTU PROTOCOL FROM 5 TO 8 CHANNELS

Address			
MODBUS	Holding Register	R/W	Notes
0001	Status Register	R	See related table.
0002	Total Weight (MSW)	R	INT. Value - Most significant word
0003	Total Weight (LSW)	R	INT. Value - Least significant word
0004	Channel Weight 1	R	INT. Value - Divisions
0005	Channel Weight 2	R	INT. Value - Divisions
0006	Channel Weight 3	R	INT. Value - Divisions
0007	Channel Weight 4	R	INT. Value - Divisions
0008	Channel Weight 5	R	INT. Value - Divisions
0009	Channel Weight 6	R	INT. Value - Divisions
0010	Channel Weight 7	R	INT. Value - Divisions
0011	Channel Weight 8	R	INT. Value - Divisions
0012	Filter	R/W	Value from 0 to 9
0013	Average Sensitivity	R/W	Average cell sensitivity value max. 40000 uV/V
0014	Cell Range (MSW)	R/W	INT. Value - Most significant word
0015	Cell Range (LSW)	R/W	INT. Value - Least significant word
0016	Number of Channels	R/W	Value from 1 to 8
0017	Reference Division Value	R/W	See related table.
0018	Cell Situation	R	See related table.
0019	Profibus Address	R/W	Value from 1 to 255
0020	Release Firmware	R	Application version
0021	Canbus Baud Rate	R/W	Value from 0 to 7
0030	Data Register (MSW)	W	INT. Value - Most significant word
0031	Data Register (LSW)	W	INT. Value - Least significant word
0032	Command Register	W	See related table.

Command Register (0032)	Description
1	Zero calibration
2	FS calibration (after writing the sample weight in the Data Register (addresses 0030 and 0031)
3	Cell emulation

Cell emulation is useful in case you use a platform and one of the cells is defective, by sending this command the defective cell is disconnected and replaced with an emulation (average of the other cells).

This allows you to continue working until the broken cell is replaced.

FIELDBUS COMMUNICATION PROTOCOLS

The following table lists the registers of the input area (produced by the instrument and read by the master), which are common to all fieldbus protocols: **PROFINET, ETHERCAT, ETHERNET/IP, and PROFIBUS.**

- The registers have a **16-bit size**.
- The input area is updated at a maximum frequency of **125 Hz** (80 Hz for PROFIBUS fieldbus).
- The size of the input area configured in the fieldbus master must match the size configured in the instrument.

Register Address	INPUT AREA REGISTER 4 CHANNELS	Status Register	
0 - 1	Status Register	1.0	Stability Weight
2 - 3	Total Weight (MSW)	1.1	Empty Scale
4 - 5	Total Weight (LSW)	1.2	Emulated Cell
6 - 7	Channel 1 Weight	1.3	Underload
8 - 9	Channel 2 Weight	1.4	Overload
10 - 11	Channel 3 Weight	1.5	OffRange
12 - 13	Channel 4 Weight	1.6	
14 - 15	Filter	1.7	
16 - 17	Average Sensitivity		
18 - 19	Cell Range (MSW)		
20 - 21	Cell Range (LSW)		
22 - 23	Number of Channels		
24 - 25	Reference Division Value		
26 - 27	Cell Situation (see table)		
28 - 29	Profibus Address		
30 - 31	RS485 Baud Rate		
32 - 33	Release Firmware		

Register Address	INPUT AREA REGISTER 8 CHANNELS	Status Register	
0 - 1	Status Register	1.0	Stability Weight
2 - 3	Total Weight (MSW)	1.1	Empty Scale
4 - 5	Total Weight (LSW)	1.2	Emulated Cell
6 - 7	Channel Weight 1	1.3	Underload
8 - 9	Channel Weight 2	1.4	Overload
10 - 11	Channel Weight 3	1.5	OffRange
12 - 13	Channel Weight 4	1.6	
14 - 15	Channel Weight 5	1.7	
16 - 17	Channel Weight 6		
18 - 19	Channel Weight 7		

20 - 21	Channel Weight 8		
22 - 23	Filter		
24 - 25	Average Sensitivity		
26 - 27	Cell Range (MSW)		
28 - 29	Cell Range (LSW)		
30 - 31	Number of Channels		
32 - 33	Reference Division Value		
34 - 35	Cell Situation (see table)		
36 - 37	Profibus Address		
38 - 39	RS485 Baud Rate		
40 - 41	Release Firmware		

FIELDBUS COMMUNICATION PROTOCOLS (CONTINUED)

The following table lists the output area registers (written by the master and acquired by the instrument), common to all fieldbus protocols: **PROFINET, ETHERCAT, ETHERNET/IP, and PROFIBUS**.

The registers have a **16-bit size**.

The registers written by the master in the output area are read by the instrument at a maximum frequency of **12.5 Hz** (8.0 Hz for PROFIBUS fieldbus).

The output area size configured in the fieldbus master must match the size configured in the instrument.

Register Address	OUTPUT AREA REGISTER	Command Register	
0 - 1	Command Register	**1**	Zero Calibration
2 - 3	Data Register (MSB)	**2**	Full-Scale Calibration
4 - 5	Data Register (LSB)	**3**	Load Cell Emulation
6 - 7	Digital Filter	**4**	Set Digital Filter
8 - 9	Average Cell Sensitivity	**5**	Set Average Cell Sensitivity
10 - 11	Load Cell Capacity (MSB)	**6**	Set Load Cell Capacity
12 - 13	Load Cell Capacity (LSB)	**7**	Set Number of Load Cells
14 - 15	Number of Load Cells	**8**	Set Division Value
16 - 17	Division Value (index)	**9**	Set Fieldbus Address
18 - 19	Fieldbus Address	**10**	Set Fieldbus Baud Rate
20 - 21	Fieldbus Baud Rate	**48 + num**	Calibration of Load Cell num
		64 + num	Full-Scale Calibration of Load Cell num

FIELDBUS CALIBRATION EXAMPLES

Zero Calibration for All Load Cells (Command 1):

To perform a zero calibration for all scales, send Command 1 to the Command Register with unloaded scales.

Full-Scale Calibration for All Load Cells (Command 2):

- Perform a calibration using a reference weight of **200 kg** and a division value of **0.00.**
- Place the reference weight on each load cell (if multiple load cells are under the same platform, e.g., 4 load cells, to calibrate each one to **200 kg**, place **800 kg** on the platform).
- **Set the Data Register to 20000:**

$$20000 = 200 \times (10^{n\ Decimals})$$

Equivalent to 0x00004E20 in hexadecimal.

- Send **Command 2** to the Command Register.

Zero Calibration for a Single Load Cell (Command 0x30 + Load Cell Number):

To perform a zero calibration for a specific scale:

- Send **Command 0x31** to the **Command Register** for Scale 1 with no load.
- Send **Command 0x32** for **Scale 2**, and so on.

Full-Scale Calibration for a Single Load Cell (Command 0x40 + Load Cell Number):

- Perform a calibration using a reference weight of **200 kg** and a division value of **0.00.**
- Place the reference weight on **Load Cell 1.**
- **Set the Data Register to 20000:**

$$20000 = 200 \times (10^{n\ Decimals})$$

Equivalent to 0x00004E20 in hexadecimal.

- Send **Command 0x41** to the Command Register.

CANOPEN COMMUNICATION PROTOCOL

The CANopen protocol is implemented through the **optional board**, which acts as a serial-CANopen communication interface for the **WT 05** instrument.

THIS INTERFACE ALLOWS USERS TO:

- Set various parameters of the instrument
- Read process values via the CANopen protocol

The **firmware version** implemented in the board is P23002.

The following pages describe the function of the instrument registers managed by the protocol, which are included in the Object Dictionary detailed later.

IMPORTANT: Some parameters differ from those described previously for the Modbus protocol.

EDS FILE

The configuration **EDS** file to be used is: **PCAN0201.EDS**

CANOPEN PROTOCOL WARNINGS

When a **RESET** command is sent to the instrument, it is necessary to wait at least 1.5 seconds before sending additional commands to the slave.

BAUDRATE CANBUS

Val.	Baudrate Canopen
0	LSS
1	20 K
2	50 K
3	125 K
4	250 K
5	500 K
6	800 K
7	1 M
8	AUTO

CANOPEN - OPERATING FUNCTIONS

CONSTANT WEIGHING DATA (THEORETICAL CALIBRATION)

UD_CAPAC	**SYSTEM WEIGHING CAPACITY** Set the value corresponding to the sum of the nominal capacities of the load cells. This value represents the full-scale weight of the weighing system. When modified, a theoretical weight calibration is performed. ***Refer to the UD_CAPAC register in the Object Dictionary (OD).***

UD_SENS	**LOAD CELL SENSITIVITY** Set the value corresponding to the average sensitivity of the load cells at nominal capacity, in **mV/V**. Accepted values range from **0.5 to 4 mV/V**. If no value is set, **2 mV/V** is assumed. ***When modified, a theoretical weight calibration is performed. Refer to the UD_SENS register in the OD.***
UD_DIV	**DIVISION VALUE** The division value is expressed in selectable measurement units between **0.0001** and **50**. ***Refer to the UD_DIV register in the OD.***

Register value	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Division value	0.0001	0.0002	0.0005	0.001	0.002	0.005	0.01	0.02	0.05
Register value	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Division value	0.1	0.2	0.5	1	2	5	10	20	50

AI_DEC_DGT_PV	**DECIMAL DIGITS** Represents the number of decimal places displayed. When modifying the system capacity value, a division value and decimal places are automatically selected for the best **10,000** divisions. The value transmitted by the **AI_INPUT_PV** register will be an integer, with the last digits representing the desired decimals. Users must divide the received value according to the requested decimals to obtain the correct weight. ***Refer to the AI_DEC_DGT_PV register in the OD.***

UD_ZERO_CAL (*)	**ZERO CALIBRATION** Perform the operation with an empty load cell to reset the displayed weight. This operation can be repeated multiple times. Calibration is performed by writing **6F72657Ah** ('**o**', '**r**', '**e**', '**z**') into the appropriate sub-register of **UD_ZERO_CAL**. ***Refer to the UD_ZERO_CAL register in the OD.***
UD_W_CAL (*)	**SAMPLE WEIGHT CALIBRATION** Before executing, place a sample weight on the load cell. If the set value exceeds the instrument's resolution, the calibration is not performed. Calibration can be repeated as needed. The calibration is executed by writing **6E617073h** ('**n**', '**a**', '**p**', '**s**') into the **UD_W_CAL** register and setting the weight value in **UD_SPAN_VAL**. This value must be multiplied by a power of 10 based on the number of decimal places (e.g., if 3 decimals are set and the weight is 2, the value entered should be $2 \times 10^3 = 2000$). ***Refer to the UD_W_CAL register in the OD.***
UD_ZERO_S	**SEMI-AUTOMATIC ZERO** This function corrects minor zero shifts in the scale. ***Refer to the UD_ZERO_S register in the OD.***

(*) Calibration commands can be executed either on individual load cells or on the entire system, depending on the sub-index of the specified register. Refer to the sub-registers detailed in the CANOPEN protocol register description pages.

IMPORTANT: The operational functions described so far take immediate effect upon accessing the corresponding register. However, to permanently save the new register values, data storage is required. Refer to the STORE_PAR register in the Object Dictionary (OD).

FILTER

AI_FILT_CON	**WEIGHT FILTER** This parameter adjusts the digital filter applied to the measured weight. The filter can have values ranging from **0** to **9**, where **0** applies the minimum filtering effect and **9** applies the maximum. ***Refer to the FILT register in the OD.***

NUMBER OF CELLS

UD_N_CELLS	**NUMBER OF LOAD CELLS** This parameter indicates the number of load cells connected to the system. ***Refer to the UD_N_CELLS register in the OD.***

CONVERTER OUTPUT RATE

AI_ADC_RATE	**CONVERTER OUTPUT RATE** This parameter defines the output rate of the converter.	
	Register Value	**Hz**
	0	50
	1	100
	2	200
	3	400
	4	800
	Refer to the register inside the OD named AI_ADC_RATE	

IMPORTANT: The operational functions described so far take immediate effect upon accessing the corresponding register. However, to permanently save the new register values, data storage is required. Refer to the STORE_PAR register in the OD.

CANOPEN PROTOCOL DESCRIPTION

The implementation of the protocol supports both the "**Communication Profile Area**" (CiA DS301) and the "**Device Profile Area**" (CiA DS404).

NETWORK MANAGEMENT (NMT)

The Network Management (NMT) handles the following states with their respective protocols:

- **Pre-Operational**
- **Operational**
- **Stopped**
- **Reset**
- **Reset Communication**

The **Heartbeat Protocol** is supported and is set by default to 1 second. It can be disabled by setting the intervention time to 0 (**Index = 1017h**).

EMERGENCY MESSAGE HANDLING

Emergency messages are triggered when the following events occur or cease:

- **Sensor Fault (Code = 5030h, as per DS404)**: Triggered when the load cell signal is undetectable due to a missing or incorrect connection, or due to a hardware failure.
- **Input Overload (Code = F001h, as per DS404)**: Triggered when the load cell signal exceeds the instrument's reading range.

TPDO MAPPING AND TRANSMISSION TYPES

Three **TPDOs** (Transmit Process Data Objects) are managed, each with different transmission types:

- **Synchronous Acyclic (00h)**: The instrument measurement is transmitted in response to the SYNC signal only if the data has been updated since the last transmission.
- **Synchronous Cyclic (01h)**: The instrument measurement is always transmitted in response to the SYNC signal, even if it hasn't been updated.
- **Asynchronous (FFh) (Default Mode)**: The PDO is transmitted at a predetermined programmable frequency (default = 10 Hz).

TPDO DEFAULT MAPPING

TPDO1

By default, **TPDO1** transmits the following values:

- **Analog Input Process Value (Index = 9130h—sub1)**: The current measured weight formatted as a Signed int 32-bit. This value refers to the overall system weight (sum of all individual load cells).
- **Analog Input Status (Index = 6150h—sub1)**: The status register of the current measurement as described in the Object Dictionary (OD). Unsigned int 8-bit.
- **Cell Identification Register (Index = 2009h—sub1)**: The register indicating the load cell number where an anomaly occurred. Unsigned int 8-bit.

TPDO2

By default, **TPDO2** transmits the following values:

- **Analog Input Process Value (Index = 9130h—sub2)**: The current weight measured in process units (kg), formatted as Signed int 32-bit. This value refers to **Load Cell 1**.
- **Analog Input Process Value (Index = 9130h—sub3)**: The current weight measured in process units (kg), formatted as Signed int 32-bit. This value refers to **Load Cell 2**.

TPDO3

By default, **TPDO3** transmits the following values:

- **Analog Input Process Value (Index = 9130h—sub4)**: The current weight formatted as Signed int 32-bit. This value refers to **Load Cell 3**.
- **Analog Input Process Value (Index = 9130h—sub5)**: The current weight formatted as Signed int 32-bit. This value refers to **Load Cell 4**.

CANOPEN SPECIFICATIONS

PARAMETERS	DESCRIPTION
NMT Slave	NMT Slave
Error Control	Heartbeat producer
Boot-up	Yes
Node ID Range	1 - 127
Node ID Assignment	User interface settings
CANopen Bit-Rates	10 – 500 kbit/sec
Type of Bit-Rate Adjustment	User interface settings
No. of PDO	3 TPDO
PDO Modes	Event-triggered (Triggered by event-timer) Synchronous (cyclic) Synchronous (acyclic)
PDO Mapping	Yes (3 obj/PDO for PDO1, 2 obj/PDO for PDO2, PDO3)
Emergency Message	Yes (Producer)
No. of SDO	1 Server SDO (Expedited and Segmented transfer)
Client SDO	No
Sync	Sync producer: no Sync counter: no
Timestamp	No
Additional Functions	None
Supported Application Layer	CiA 301 V 4.0.2
Supported Frameworks	None
Supported Profiles	CiA DS-404
Certified	No

OBJECT DICTIONARY

COMMUNICATION PROFILE AREA

Generic parameters:

Index	Sub-Index	Name	Description	Type	Attribute
1200h	0	SDO_PAR	Number of SDO entries (=2)	U8	ro
	1		COB_ID Client->Server (rx) (= 600h + Node_ID)	U32	ro
	2		COB_ID Server->Client (tx) (= 580h + Node_ID)	U32	ro
1009h	0	HW_VER	Manufacturer Hardware Version	Visible String	ro
100Ah	0	HW_VER	Manufacturer Hardware Version	Visible String	ro
1010h	0	STORE_PAR	Largest sub-index supported (1-7Fh)	U8	ro
	1		Save All Parameters (**)	U32	rw
	2		Save Communication Pars (**)	U32	rw
	3		Save Application Pars (**)	U32	rw
1014h	0	COB_ID EMCY	COB_ID Emergency msg (=80+Node_ ID)	U32	ro
1017h	0	HBT_TIME	Heartbeat Time	U16	rw
1018h	0	OBJ_ID	Number of sub-index entries (=3)	U8	Const
	1		Vendor ID	U32	Const
	2		Product Code	U32	Const
	3		Revision Number	U32	Const

(*) The value is 00020194h in accordance with DS-404.

(**) Signature: 65766173h ('a','v','e','s').

SDOS SERVER PARAMETERS

Index	Sub-Index	Name	Description	Type	Attribute
1200h	0	SDO_PAR	Number of SDO entries (=2)	U8	ro
	1		COB_ID Client->Server (rx) (= 600h + Node_ID)	U32	ro
	2		COB_ID Server->Client (tx) (= 580h + Node_ID)	U32	ro

T_PDOS COMMUNICATION PARAMETERS

Index	Sub-Index	Name	Description	Type	Attribute
1800h	0	T_PDO_CPAR1	Largest sub-index supported (=5)	U8	ro
	1		COB_ID used by PDO (= 180h + Node_ID)	U32	ro
	2		PDO transmission type (*)	U8	ro (rw)
	3		Inhibit Time (=0)	U16	rw
	4		Reserved	U8	rw
	5		Event Timer (mS)	U16	rw

Index	Sub-Index	Name	Description	Type	Attribute
1801h	0	T_PDO_CPAR2	Largest sub-index supported (=5)	U8	ro
	1		COB_ID used by PDO (= 280h + Node_ID)	U32	ro
	2		PDO transmission type (*)	U8	ro (rw)
	3		Inhibit Time (=0)	U16	rw
	4		Reserved	U8	rw
	5		Event Timer (mS)	U16	rw

Index	Sub-Index	Name	Description	Type	Attribute
1802h	0	T_PDO_CPAR3	Largest sub-index supported (=5)	U8	ro
	1		COB_ID used by PDO (= 380h + Node_ID)	U32	ro
	2		PDO transmission type (*)	U8	ro (rw)
	3		Inhibit Time (=0)	U16	rw
	4		Reserved	U8	rw
	5		Event Timer (mS)	U16	rw

(*) Transmission type:

00h = synchronous acyclic (PDO is transmitted following the reception of SYNC, but only if a new measurement has been acquired).

01h = synchronous cyclic (PDO is always transmitted following the reception of SYNC).

FFh = asynchronous (DEFAULT) (PDO is transmitted periodically based on event timer)

Other transmission types provided by Cia DS-301 are not supported.

T_PDOS MAPPING PARAMETERS

Index	Sub-Index	Name	Description	Type	Attribute
1A00h	0	T_PDO_MPAR1	n. of mapped applic. Objects in PDO (=3)	U8	ro
	1		Applic.Obj.map 1 (*)	U32	ro
	2		Applic.Obj.map 2 (*)	U32	ro
	3		Applic.Obj.map 3 (*)	U32	ro

The structure of the entries from sub-index **1h** - **40h** is as follows

Byte: MSB LSB

index (16 bit)	Sub-Index	Object lenght (8 bit)

(*) The following default values are defined:

- **Sub-index 0** = 3h.
- **Sub-index 1** = 9130 0120h (Index = 9130h, sub-index 01, 32 bit length). **(TOTAL WEIGHT)**
- **Sub-index 2** = 6150 0108h (Index = 6150h, sub-index 01, 8 bit length). **(Analog Input Status)**
- **Sub-index 3** = 2009 0108h (Index = 6150h, sub-index 01, 8 bit length). **(Cell Identification Register)**

Index	Sub-Index	Name	Description	Type	Attribute
1A01h	0	T_PDO_MPAR2	n. of mapped applic. Objects in PDO (=2)	U8	ro
	1		Applic.Obj.map 1 (*)	U32	ro
	2		Applic.Obj.map 2 (*)	U32	ro

(*) The following default values are defined:

- **Sub-index 0** = 2h.
- **Sub-index 1** = 9130 0220h (Index = 9130h, sub-index 02, 32 bit length). **(CELL WEIGHT 1)**
- **Sub-index 2** = 9130 0320h (Index = 9130h, sub-index 03, 32 bit length). **(CELL WEIGHT 2)**

Index	Sub-Index	Name	Description	Type	Attribute
1A02h	0	T_PDO_MPAR3	n. of mapped applic. Objects in PDO (=2)	U8	ro
	1		Applic.Obj.map 1 (*)	U32	ro
	2		Applic.Obj.map 2 (*)	U32	ro

(*) THE FOLLOWING DEFAULT VALUES ARE DEFINED:

- **Sub-index 0** = 2h.
- **Sub-index 1** = 9130 0420h (Index = 9130h, sub-index 02, 32 bit length). **(CELL WEIGHT 3)**
- **Sub-index 2** = 9130 0520h (Index = 9130h, sub-index 03, 32 bit length). **(CELL WEIGHT 4)**

MANUFACTURER DEFINED PARAMETERS

Index	Sub-Index	Name	Description	Type	Attribute
2001h	0	UD_CAPAC	Largest sub-index supported (1-7Fh)	U8	ro
	1		Load Cell Capacity	U32	rw
2002h	0	UD_SENS	Largest sub-index supported (1-7Fh)	U8	ro
	1		Load Cell Sensitivity	REAL32	rw
2003h	0	UD_DIV	Largest sub-index supported (1-7Fh)	U8	ro
	1		Weight Division Value	U8	rw
2004h	0	UD_W_CAL	Largest sub-index supported (1-7Fh)	U8	ro
	1		Weight calibration command (all cells) (**)	U32	rw
	2		Weight calibration command (cell 1) (**)	U32	rw
	...		...	U32	rw
	5		Weight calibration command (cell 4) (**)	U32	rw
2005h	0	UD_ZERO_CAL	Largest sub-index supported (1-7Fh)	U8	ro
	1		Zero calibration command (all cells) (*)	U32	rw
	2		Zero calibration command (cell 1) (*)	U32	rw
	...		...	U32	rw
	5		Zero calibration command (cell 4) (*)	U32	rw
2008h	0	UD_N_CELLS	Largest sub-index supported (1-7Fh)	U8	ro
	1		Number of Cells	U8	rw
2009h	0	UD_ID_CELL	Largest sub-index supported (1-7Fh)	U8	ro
	1		Cell Identification Register (***)	U8	ro
200Ah	0	UD_SPAN_VAL	Largest sub-index supported (1-7Fh)	U8	ro
	1		Value of Sample Weight (**)	U32	rw
200Bh	0	UD_ZERO_S	Largest sub-index supported (1-7Fh)	U8	ro
	1		Zero calibration command (all cells) (*)	U32	rw

(*) Signature: 6F72657Ah ('o','r','e','z').

(**) For weight calibration: enter the value of the sample weight loaded on the cell in register 200Ah and then program the value 6E617073h ('n', 'a', 'p', 's') in register 2004h

(***) This value identifies the cell in which an anomaly occurred. See the following table:

CELL IDENTIFICATION REGISTER TABLE (2009H—SUB 1)

Value Hexadecimal	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Meaning
0	0	0	0	0	0	0	0	0	Normal operation -
1	0	0	0	0	0	0	0	1	no errors
2	0	0	0	0	0	0	1	0	Cell 1 fault
4	0	0	0	0	0	1	0	0	Cell 2 fault
8	0	0	0	0	1	0	0	0	Cell 3 fault
10	0	0	0	1	0	0	0	0	Cell 4 fault
20	0	0	1	0	0	0	0	0	Cell 5 fault
40	0	1	0	0	0	0	0	0	Cell 6 fault
80	1	0	0	0	0	0	0	0	Cell 7 fault
									Cell 8 fault

DEVICE SPECIFIC PARAMETERS

Analog input function block

Index	Sub-Index	Name	Description	Type	Attribute
6114h	0	AI_ADC_RATE	Number of SDO entries (=1)	U8	ro
	1		Analog Input ADC Sample Rate	U32	rw
6132h	0	AI_DEC_DGT_PV	Number of SDO entries (=1)	U8	ro
	1		Analog Input Decimal digit of Process Value 1 (0–4)	U8	ro
6150h	0	AI_STATUS	Number of SDO entries (=1)	U8	ro
	1		Analog Input Status (*)	U8	ro
61A1h	0	AI_FILT_CON	Number of SDO entries (=1)	U8	ro
	1		Analog Input Filter Constant	U8	rw
9130h	0	AI_INPUT_PV	Number of SDO entries (=4)	U8	ro
	1		Analog Input Process Value (peso totale) (**)	S32	ro
	2		Analog Input Process Value (canale 1) (**)	S32	ro
	3		Analog Input Process Value (canale 2) (**)	S32	ro
	4		Analog Input Process Value (canale 3) (**)	S32	ro
	5		Analog Input Process Value (canale 4) (**)	S32	ro

(*) Coding table of the "Analog Input Status" Register (6150h—sub 1) (Referred to total weight)

Bit	Description
0	Offrange
1	Overload
2	Underload
3	Memory Flag (Modified registers not yet saved with STORE_PAR register)
4	Zero Band (Total weight < 20 div)
5	Not used
6	Not used
7	Not used

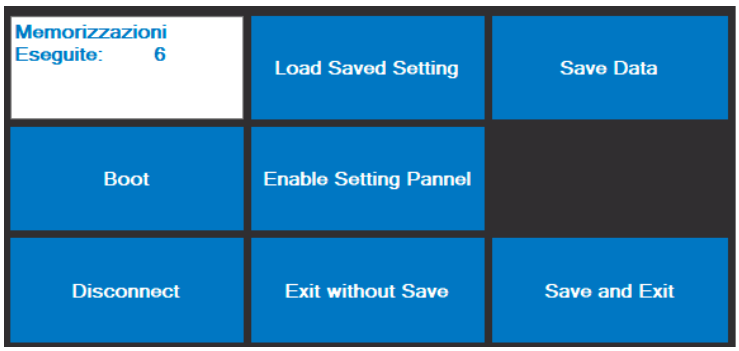
(**) The weight value is automatically multiplied by 10^n, where n is the number of decimal places set. For example, with 3 decimal places and a weight of 1.001 kg, the register will contain the value 1001.

FIRMWARE UPDATE PROCEDURE

ACTIVATE BOOTLOADER MODE

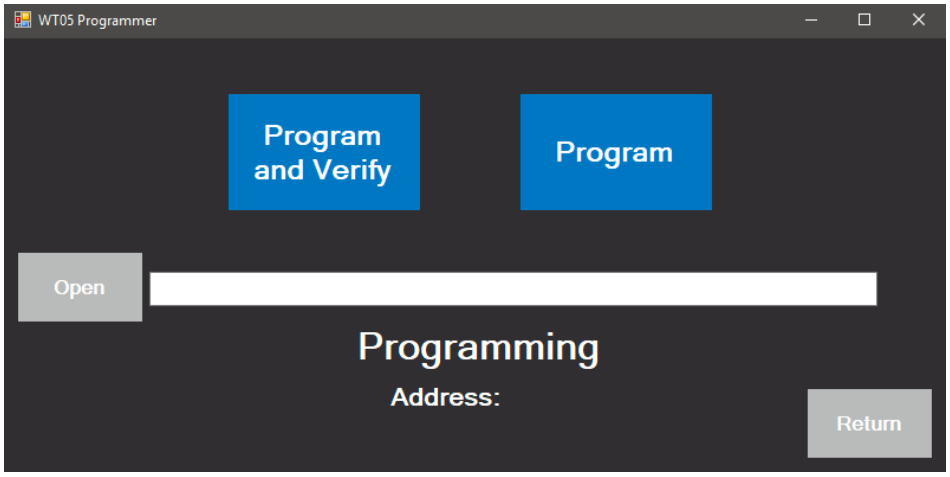
Open the **PC** application and press the "**Boot**" button.

The board will enter **BOOT** mode, and the **LED** on the board will start flashing rapidly.



LAUNCH THE PROGRAMMING SOFTWARE

The PWIN90 "**Programmer**" software will automatically start.



SELECT AND LOAD THE FIRMWARE

Click "**Browse**" to select the firmware file to be programmed.

Click "**Program and Verify**" to start the programming process.

FIRMWARE UPDATE PROCESS

During programming, the following status messages will be displayed:

ERASING – The previous firmware is being removed.

PROGRAMMING – The new firmware is being written to the device.

VERIFYING OPERATION – The system is checking the integrity of the programmed firmware.

COMPLETED – The firmware update is successful.

Once the process is complete, the instrument is ready for operation with the updated firmware.

Certificate of Compliance

Certificate Number:
E546509

Report Reference:
E546509-20250306

Issue Date:
2025-06-06

Issued to:

VPG Technology Development Ltd.
Tsela Ha-Har 18, Modi'In Makabim-Re'Ut Israel 7179574
Israel

This certificate confirms that representative samples of:

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See Addendum Page for Product Designation(s).

Have been evaluated by UL in accordance with the component requirements in the Standard(s) indicated on this Certificate. UL Recognized components are incomplete in certain constructional features or restricted in performance capabilities and are intended for installation in complete equipment submitted for investigation to UL LLC.

UL 62368-1 and CSA C22.2 No. 62368-1:19, Audio/Video, Information and Communication Technology Equipment - Part 1: Safety Requirements

Additional Information:
See the UL Online Certifications Directory at https://iq.ulprospector.com for additional information.

This Certificate of Compliance indicates that representative samples of the product described in the certification report have met the requirements for UL certification. It does not provide authorization to apply the UL Recognized Component Mark. Only the Authorization Page that references the Follow-Up Services Procedure for ongoing surveillance provides authorization to apply the UL Mark.

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David Piecuch
UL Mark Certification Program Owner

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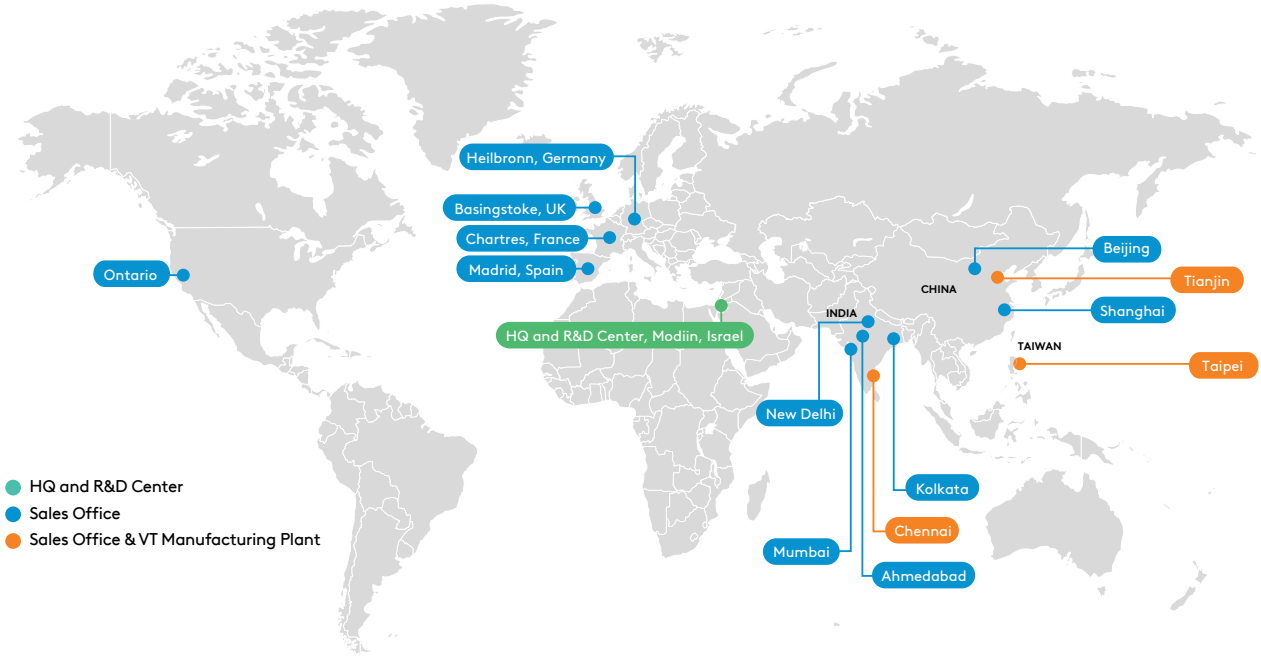




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