

TECHNICAL MANUAL



DAT 200 Serial and ETHERNET weighing Indicator/Trasnmitter

Software version PW311

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WARNINGS

READ this manual BEFORE operating or servicing on the instrument.

FOLLOW these instructions carefully.

SAVE this manual for future use.



CAUTION

The installation and maintenance of this instrument must be allowed to qualified personnel only.

Be careful when you perform inspections, testing and adjustment with the instrument switched on.

Failure to observe these precautions may be dangerous.

DO NOT allow untrained personnel to work, clean, inspect, repair or tamper with this instrument.

INTRODUCTION

The DAT 200 is a weight transmitter to be matched to the load cells to detect the weight in every situation.

The module is easy to install and can be mounted on 35 mm DIN rail.

The display allows easy reading of the weight, the configuration parameters and errors.

The 3 keys located below the display and protected by the front door allow the Operator to perform the functions of ZERO and CALIBRATION as well as datasheet and real calibration.

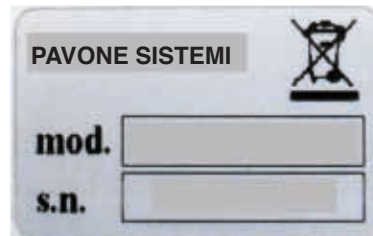
The DAT 200 use RS232 serial port with ASCII and Modbus RTU protocols to be connected to PC, PLC and remote units.

The presence of the ETHERNET connection allows the use in the most modern industrial environments.

FIELD BUS AVAILABLE:

- **DAT 200/ETHERNET:** weight transmitter with serial output RS232 and ETHERNET.

IDENTIFICATION PLATE OF THE INSTRUMENT



It's important to communicate this data, in the event of a request for information. The software number and release number are shown on the cover of the manual and also displayed when the instrument is switched on.



WARNINGS

The following procedures must be performed by qualified personnel. All connections must be performed when the instrument is switched off.

TECHNICAL FEATURES

| | |
|---|--|
| Power supply | 24 Vdc \pm 10% protected against reverse polarity. Protection with resettable fuse. |
| Max. absorption | 2W |
| Isolation | Class II |
| Operating temperature | -10°C ÷ +50°C (max. humidity 85% non-condensing) |
| Storage temperature | -20°C ÷ +60°C |
| Weight display | Numerical with 5 red led digits and 7 segments (h 7 mm) |
| Led | 2 LEDs of 3 mm |
| Keyboards | 3 mechanical keys (behind the red front door) |
| Overall dimensions | 112 x 119 x 35 mm (l x h x w), including terminal boards. |
| Installation | Brackets for DIN section or OMEGA bar |
| Material | Self-extinguishing Blend PC/ABS |
| Connections | Removable terminal boards with screws, pitch 5.08 mm |
| Input of the load cells with following features | max. 4 of 350 Ω in parallel (or 8 cells of 700 Ω). |
| Load cell excitation | 4 Vdc |
| Linearity | <0.01% of the full scale |
| Temperature drift | <0.001% of the full scale / °C |
| Internal resolution | 24 bit |
| Measuring range | -3.9 ÷ +3.9 mV/V |
| Digital filter | To be selected from 0.2 Hz to 25 Hz |
| Number of decimals weight | 0 ÷ 4 decimal places |
| Calibration of zero and full scale | From the buttons. |
| Check of load cell cable interruption | Always present |
| Serial ports | RS232 half duplex |
| Baud rate | 2400 ÷ 115200 baud |
| Maximum cable length | 15m |
| Fieldbus | ETHERNET |
| Connection | RJ45 connector |
| Protocols | TCP, Modbus TCP, UDP, IP, ICMP, ARP |
| Communications mode | TCP server |
| In compliance with the standards | EN61000-6-2, EN61000-6-3 for EMC EN61010-1 for Electrical Safety UL: FILE NO E474362 |



INSTALLATION

GENERAL INFORMATION

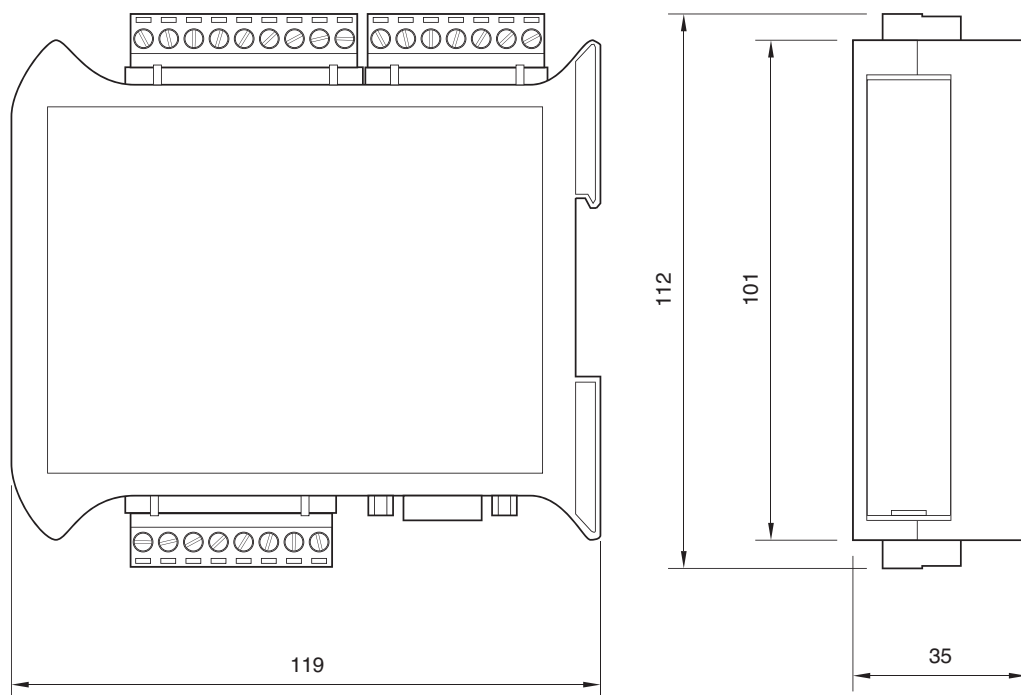
The DAT 200 consists of a motherboard, to which are added the options available, accommodated in a plastic enclosure for DIN rail 35mm.



The DAT 200 should not be immersed in water, subjected to jets of water and cleaned or washed with solvents.

Do not expose to heat or direct sunlight.

OVERALL DIMENSIONS



ELECTRICAL INSTALLATION



DAT 200 is equipped with removable screw, pitch 5.08 mm.

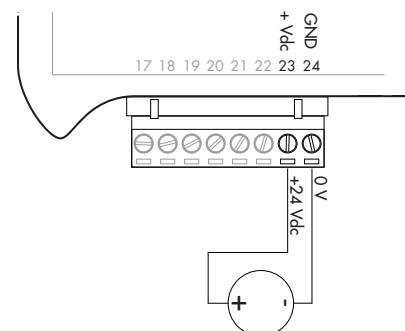
The load cell cable must be shielded and channeled away from power cables to prevent electromagnetic interferences.

INSTRUMENT POWER SUPPLY

The instrument is powered through the terminals 23 and 24. The power supply cable must be channeled separately from other cables.

The internal circuit is galvanically isolated from the supply voltage.

Power supply voltage: 24 Vdc \pm 10%, max. 2W



LOAD CELL CONNECTIONS

The cable of the load cell (or load cells) should not be channeled with other cables, but has to follow its own path.

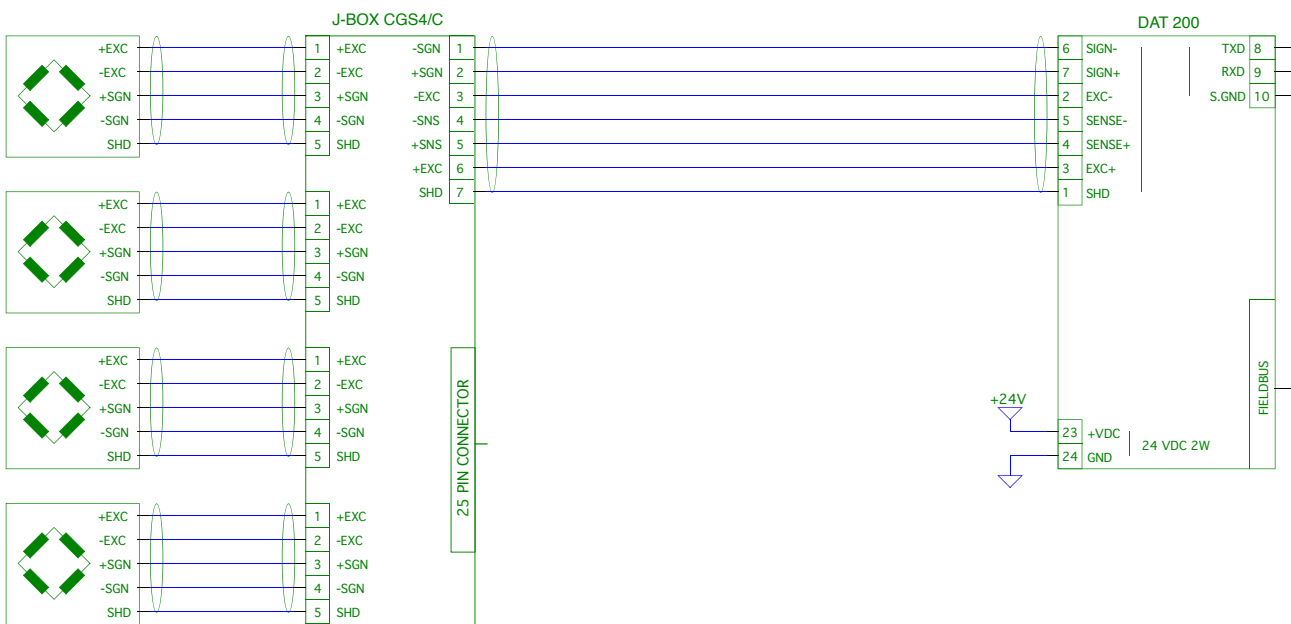
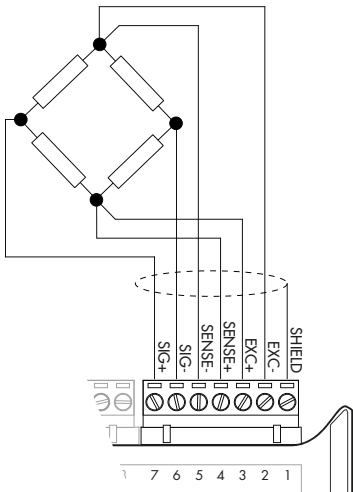
The instrument can be connected up to maximum 4 load cells of 350 ohm in parallel. The supply voltage of the load cells is 4 Vdc and is protected by temporary short circuit.

The measuring range of the instrument involves the use of load cells with a sensitivity of up to 3.9 mV/V.

The cable of the load cells must be connected to terminals 2-7 of the 7-pin removable terminal board. In the case of 4-wire load cell cable, jump terminals 2 with 5 and 3 with 4.

Connect the cell cable shield to the terminal 1.

In the case of the usage of two or more load cells, use special junction boxes (CEM4/C or CSG4/C).



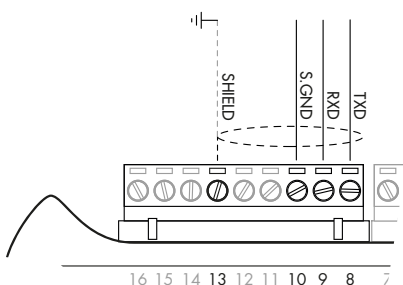
SERIAL COMMUNICATION

RS232:

The RS232 serial port is always present and can handle several protocols.

To achieve the serial connection use a suitable shielded cable and make sure to ground the screen at one of the two ends: to pin 13, if attached on the side of the instrument, to the ground, if connected on the other side.

The cable must not be channeled with power cables, maximum length of 15 meters (EIA RS-232-C).



ETHERNET CONNECTION

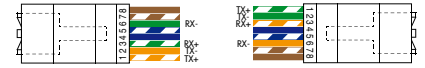
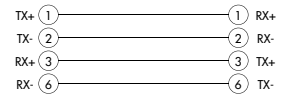
You can connect the interface to the PC directly without going through other network devices (routers, switches, hubs, LAN-bridge or whatever), but it must be used RJ45 special cables, called "crossover"

Normally the cables are "direct" and allow the connection to network devices such as routers or hubs, but they don't allow the direct connection of two PCs (although currently there are network cards with auto-sensing technology, which recognize the type of cable and the type of connection, allowing direct connections to PC-PC also using crossover cables).

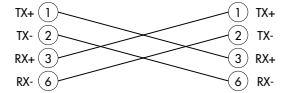
The cable must not be channeled to other cables (eg outputs connected to contactors or power cables) but, if possible, should follow their own path.



CONNESSIONE CAVO DIRETTO



CONNESSIONE CAVO INCROCIATO

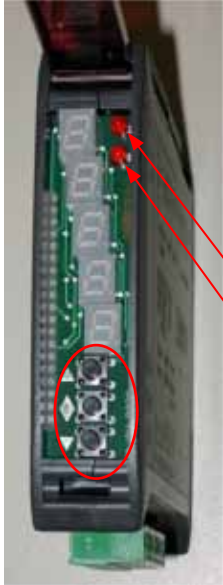


FRONT PANEL

The DAT 200 transmitter has a front door that protects the 5 digits display, the 2 status LEDs and the three front keys.

In operating mode the display shows the weight and the LEDs indicate the status of weight (net-gross).

The set-up parameters are easily accessible and can be changed through the use of the three front keys used to select, edit, confirm and save the new settings.



DISPLAY

On the 5 digits display the lowest digit indicates the least significant digit. Normally, the display shows the measured weight. During set-up procedure, the display shows the sequence of the parameters and their values, that allow the operator to set the instrument.

LED INDICATORS

In the upper part of the display there are two LED indicators:

LED 1 (on = net weight, off = gross weight, flashing = peak)

LED 2 (on = tare entered, off = no tare)

In bar-graph view, both LEDs are flashing.

USING THE KEYBOARD

The instrument is programmed and controlled through the 3 keys keyboard, with the following functions:

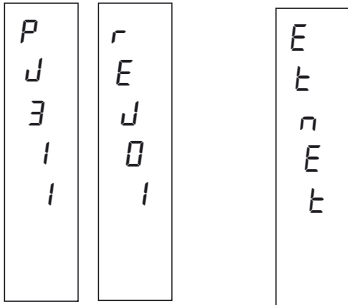
| KEY | FUNCTIONS IN WEIGHT INDICATION CONDITIONS |
|-----|---|
| ▲ | Short press: Display switches from Gross to Net weight. Long press: Display switches from Weight to Peak |
| ◆ | Short press: Display switches from Numerical to Bar-graph of to gross weight. Long press: Zeroing of the weight/peak displayed. |
| ▼ | Short press: Sending the data to the serial line (if the manual protocol was selected) Long press: Set point programming (DAT 200/A) |
| ▼ ◆ | Pressed at the same time: Accessing the Main Menu |

| KEY | FUNCTION IN THE MANAGEMENT OF THE set up MENU |
|-----|--|
| ▲ | Exits the set up menu or returns to the higher level. |
| ◆ | Access its submenu, or access the set up or confirms the selected parameter. |
| ▼ | Goes to the next menu item. |

| KEY | FUNCTION IN THE MANAGEMENT OF THE SET UP SUBMENU |
|-----|---|
| ▲ | Increases the blinking digit / select the higher value. |
| ◆ | Select the next digit. If the flashing digit is the last one, confirm the value and end the set up / selection. |
| ▼ | Decrease the blinking digit / select the lower value. |

DISPLAY INFO

When the instrument is switched ON the test-display is performed. In sequence there are: software code, software version and hardware version.

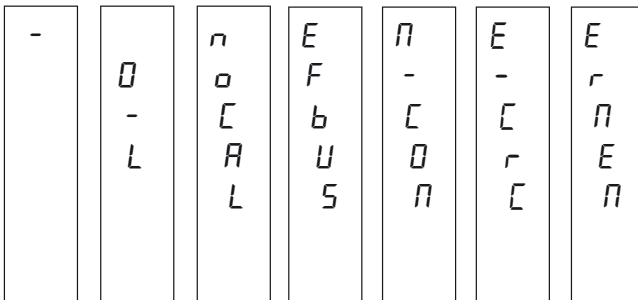



E t n E t ETHERNET hardware module

It's important to communicate these data in the event of a request for assistance.

ERRORS NOTIFICATION

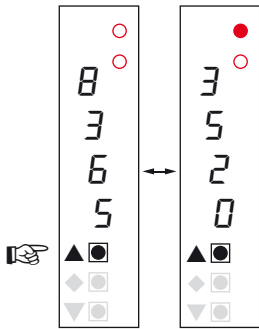
In the operating mode, the display can report the following error codes.



- Overload: The weight applied to the load cell exceeds by more than 9 divisions the maximum capacity of the weighing system.
- 0-L* O-L : No signal from the load cells or outside of the field of measurement mV/V.
- n o [A L* NOCAL: Transmitter not calibrated. Recalibration needed.
- E F b u S* EFBUS: Fieldbus interface absent or not working.
- n - c o n* N-COM: Fieldbus interface of the instrument is not connected to the network.
- E - [r [* E-CRC: CRC error during communication with the fieldbus interface of the instrument.
- E r n E n* ERMEM: Error in E²PROM. You can reprogram the instrument to the factory settings, erasing any calibration by pressing  key.

VIEWING, ZEROING THE WEIGHT AND AUTO TARE

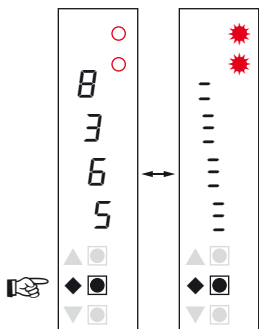
When the instrument is switched ON, the display shows the current net weight.



VIEWING THE NET WEIGHT/GROSS WEIGHT

Press the key ▲ to toggle between the net weight to gross weight and vice versa. The value displayed is reported by the LED 1 (lit: net weight). If you have not entered the tare, the net weight is equal to the gross weight.

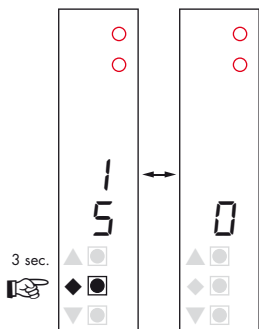
In case of negative weight, it is displayed the minus sign before the most significant digit. In case of negative weight greater than 9999, the minus sign is displayed alternatively with the most significant digit.



NUMERICAL VIEWING/BAR-GRAPH OF THE GROSS WEIGHT

Press the key ◆ to toggle from numerical display of the weight to the graphical representation of the gross weight and vice versa. The resolution is limited to 15 divisions and therefore each segment represents 1/15 of full scale.

The bar-graph display is indicated by both LEDs flashing.



ZEROING THE WEIGHT

This operation is performed to correct small movements of the zero of the scale. To perform the reset function, it is necessary to switch the display to gross weight.

Press ◆ key for 3 seconds to zeroing gross weight.

The gross weight reset command does not run under the following conditions:

Unstable weight.

Gross weight greater (positive or negative) than the OBAND value set.

If you previously performed the autotare function, this is automatically delayed. When the instrument is switched off, it is restored the value of Zero made during calibration.

AUTOMATIC TARE

To perform the auto-tare function, it is necessary to switch the display to Net weight (LED 1 on).

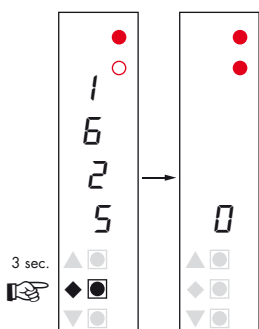
Press ◆ key for 3 seconds to perform Autotare function. Led 2 switched on. The automatic tare command does not run under the following conditions:

Unstable weight.

Negative gross weight.

Gross weight greater than the maximum capacity.

If the automatic tare is performed with gross weight = 0, the display shows again gross weight (Led 1 switched off).

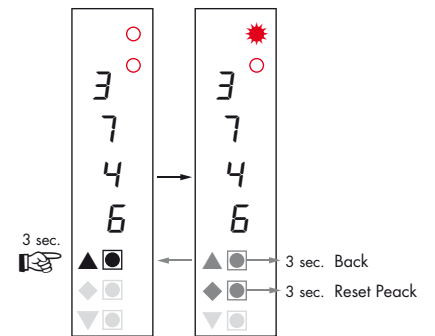


PEAK FUNCTION

The peak is related to the gross weight and is always calculated, even when it is not displayed. When you see the peak, the top LED flashes.

To store the value press ▲ key for 3 seconds. To go back to weight display press ▲ key for 3 seconds. To reset the peak value press ◆ key for 3 seconds.

The calculated peak is not retained at power off.



SET UP

GENETAL INFO

All functions of the DAT 200 can be and amended through a simple setup menu, shown on the next page. All the settings activated or selected are stored even after switching off the transmitter.

The DAT 200 is factory set. See the "default" parameters on the following pages.

At the first installation in the field some parameters need to be amended to obtain a correct indication of the displayed weight (datasheet adjustment).

This procedure may be required when you purchase the DAT 200.


The settings of the setup menu can be changed using the three front buttons.


CHANGING AND ENTERING THE PARAMETERS:




The setup parameters are grouped into a number of main menus.




To access the setup menu press simultaneously for 3 seconds  and  keys.

The display shows the message `CONF` which is the first of the main menus


Use the  and  keys to select the menu to edit


Press the  key to enter the selected menu.

| KEY | PROGRAMMING FUNCTION DURING THE MAIN MENU |
|---|--|
|  | Exits the programming menu or returns to the higher level. |
|  | Access the relevant menu or programming or confirm the selected parameter. |
|  | Skip to the next menu. |

| KEY | FUNCTION DURING PARAMETERS PROGRAMMING |
|---|--|
|  | Increases the blinking digit / select the higher value. |
|  | Select the next digit. If the flashing digit is the last, confirms the value and ends the programming / selection. |
|  | Decreases the blinking digit / select the lower. |

The parameters of the menu can take selectable values and numerical value.

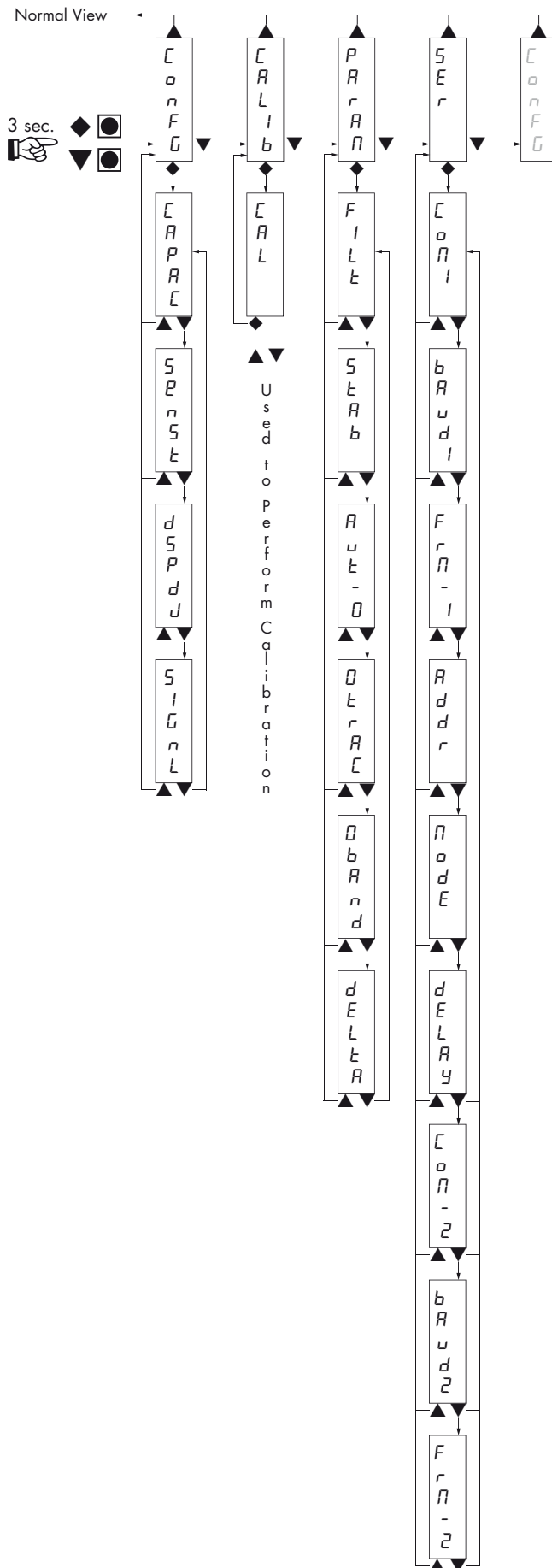
 key. Increment the flashing digit, select the next alternative value, goes back to the higher level or exits the setup menu.

 key. Select the next digit, confirm the setting of the selected parameter, access the set up parameters and access the set up submenu.

 key. Decrement the flashing digit, select the previous alternative value.

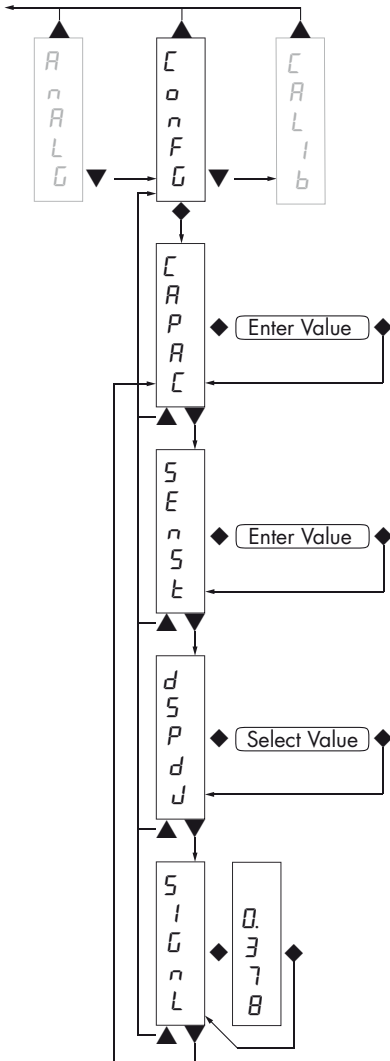
NB. To exit and save the changed data, press the  button until the indicator returns to the operating mode.

FLOW CHART MENU



CONFIGURATION PARAMETERS

Through the setting of the parameters listed below, the DAT 200 Full Scale datasheet calibration is performed. You must complete these steps with the zero calibration described on the next page. The procedure ensures, in the absence of mechanical problems, a good accuracy of the system (maximum error <1% FS).



CAPAC CAPACITY OF THE WEIGHING SYSTEM

It defines the value corresponding to the sum of the rated capacity of the load cells. In case of single load cell systems and "N" fixed supports, enter the capacity value of the load cell for the total number of supports. This figure represents the full scale value of the weighing system. Following the change of the parameter value, the datasheet calibration of the weight is recalculated.

Values: from 1 to 99999

Unit: the same of that displayed

Default: 10000

SENSIT LOAD CELLS SENSITIVITY

Set the value corresponding to the sensitivity average of the load cells, in mV/V. The instrument accepts values between 0.5 and 4 mV/V. If no values are entered, the unit assumes it is 2 mV/V.

Following the change of the sensitivity value, the datasheet calibration is recalculated.

Values: from 0.5000 to 4.0000 mV/V

Default: 2.0000

dSPdJ DIVISION VALUE

The ratio between the maximum capacity of the system and the division value is the resolution of the system (number of divisions).

Following the change of the capacity of the system, it is automatically selected the division value to the best of 5000 divisions.

Following the change of the division value, if the maximum capacity does not change, the calibration of the weight is automatically corrected.

Selectable Values:

0.0001 - 0.0002 - 0.0005

0.001 - 0,002 - 0,005

0.01 - 0.02 - 0.05

0.1 - 0.2 - 0.5

1 - 2 - 5

10 - 20 - 50

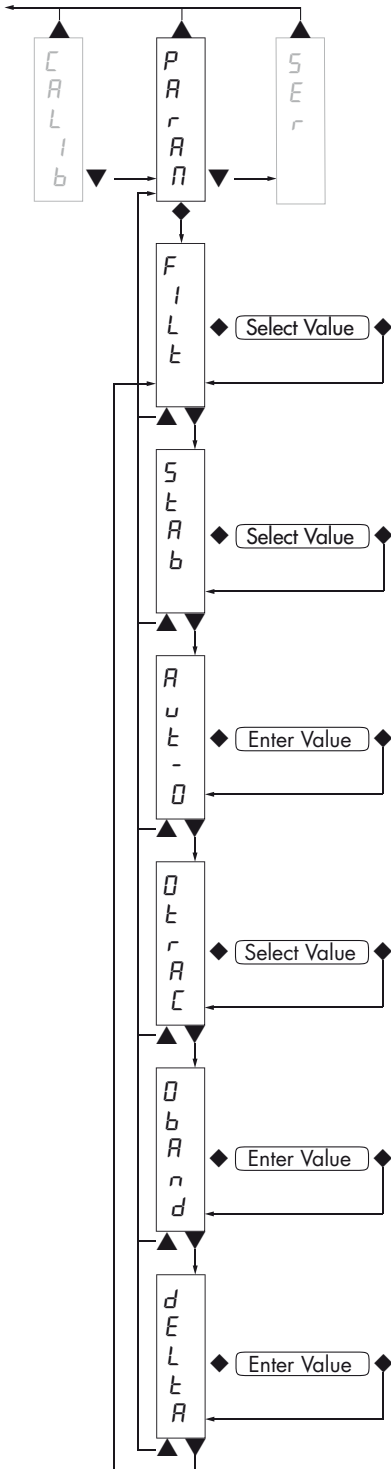
Default: 1

SIGNL TESTING THE LOAD CELLS SIGNAL

It's displayed the signal acquired from the load cells expressed in mV / V.

PARAM - WEIGHING PARAMETERS

The parameters in this menu allow to adjust the timing of the acquisition and updating of the display and the manual or automatic zeroing that the transmitter performs.



FILt WEIGHT FILTER

This parameter adjusts the refresh speed of the display and the analog output.

Low values of the filter speed up the display refresh.

High values of the filter slow down the display refresh.

| Value | Updated | Response |
|-------|---------|----------|
| 0 | 123 Hz | 25 Hz |
| 1 | 62 Hz | 16 Hz |
| 2 | 50 Hz | 8 Hz |
| 3 | 33 Hz | 5 Hz |
| 4 | 16 Hz | 2.5 Hz |
| 5 | 12 Hz | 1.5 Hz |
| 6 | 10 Hz | 1 Hz |
| 7 | 8 Hz | 0.7 Hz |
| 8 | 6 Hz | 0.4 Hz |
| 9 | 4 Hz | 0.2 Hz |

Default: 5

StAb WEIGHT STABILITY

This parameter defines the divisions number needed to deem the weight stable.

A large number of divisions allows the transmitter to detect quickly the weight stability, which is needed when executing tare and print commands.

| Value | Change |
|-------|---|
| 0 | Always stable weight |
| 1 | Stability reached quickly |
| 2 | Stability reached with medium parameters |
| 3 | Stability reached accurately |
| 4 | Stability reached with the highest accuracy |

Default: 2

Aut-0 AUTOZERO AT POWER ON

This parameter defines the maximum resettable weight upon power on.

This operation corresponds to a zero calibration of the system and is executed only if the weight is stable and below the set value.

Value from 0 to the value of the CAPAC parameter.

Default: 0

0tRc **TRACKING THE ZERO**

This function allows a momentary zero calibration compensating the eventual temperature drift of the weight.

At power off it automatically returns to the previous calibration.

The maximum weight resettable by this parameter is 2% of the range of the system.

To disable this feature, use the value 0.

| <i>Value</i> | <i>Change</i> |
|--------------|---------------|
| 0 | Control OFF |
| 1 | 0.5 div/sec |
| 2 | 1 div/sec |
| 3 | 2 div/sec |
| 4 | 3 div/sec |

Default: 0

0bRnd **ZERO BAND**

This parameter defines the number of divisions resettable by pressing the zero front button or Input 1.

Values: from 0 to 200

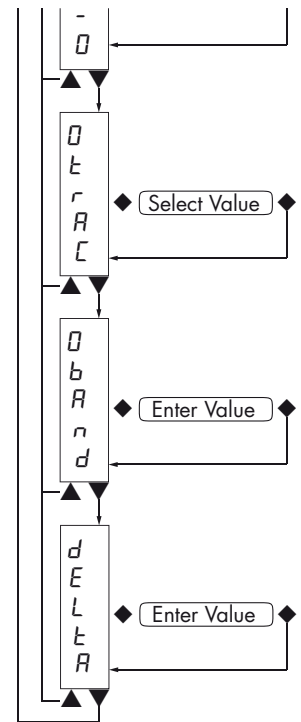
Default: 100

dELtA **WEIGHT DELTA**

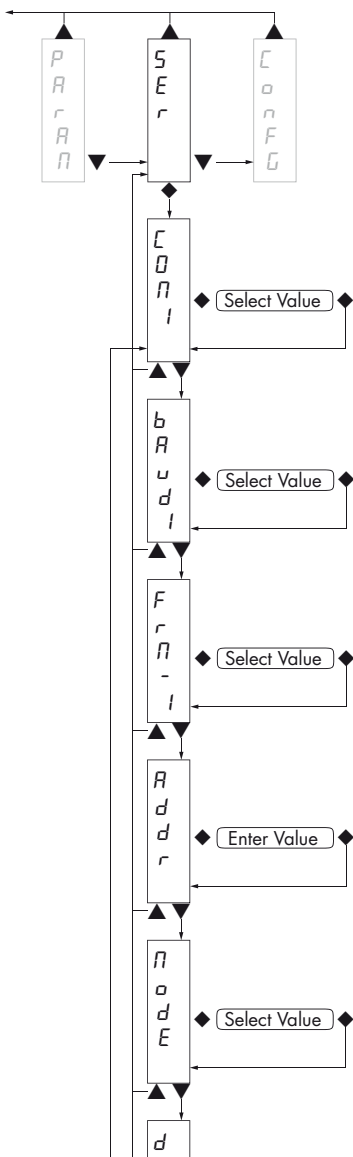
It defines the minimum number of divisions needed to discriminate two consecutive weighing in serial transmissions of the weight.

Values: from 0 to 200

Default: 20



SER - SETTING THE SERIAL COMMUNICATION PORTS



COM1 COM1: It defines the use of the COM1 serial port.

None: Serial communication OFF

Contn: Continuous transmission of the weight string. It can be used, for example, to drive a remote display. See details in the relevant paragraph.

Deman: When the Operator presses the front button or through Input 2, a string of weight is transmitted. The command is accepted if the weight is stable. Between two consecutive transmissions the weight must have a variation of at least the parameter "Weight delta".

Autom: It's automatically transferred to a string of weight when the weight stabilizes at a value higher than the minimum weight (20 divisions). Between two consecutive transmissions the weight must have a variation of at least the value set in the parameter "Delta Weight".

Slave: ASCII protocol. See details in the relevant paragraph.

Modbs: MODBUS RTU (slave) protocol. See details in the relevant paragraph.

Selectable Values:

None

Contn

Deman

Autom

Slave

Modbs

Default: Modbs

bAUDI BAUD RATE COM1

It defines the RS232 serial port baudrate.

The value must be set to the same value of the PC / PLC or remote display.

Selectable Values:

2400

4800

9600

19200

38400

57600

115200

Default: 9600

Frn-1 **COM1 DATA FORMAT**

It defines the data format of the RS232 serial port.

The value must be set to the same value of the PC / PLC or remote display.

In the case of MODBUS or SLAVE protocol, selections of the 7-bit data formats (E-7-1 and O-7-1) are not accepted (error message "Nvalid").

Selectable Values:

N-8-1

N-8-2

E-8-1

O-8-1

E-7-1

O-7-1

Default: N-8-1

Addr **COM1 / COM2 SERIAL COMMUNICATION ADDRESS**

Configuration of the address used in the transmission protocols and in the MODBUS protocol.

Value from 000 to 99.

Default: 01

ModE **TRANSMITTED DATA WEIGHT COM1 / COM2**

Selecting the value transmitted with continuous, automatic and manual protocols (see relevant paragraph).

Selectable Values:

Net

Gross

Peak

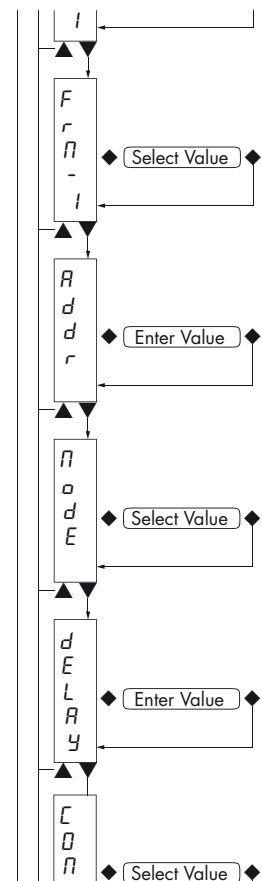
Default: Gross

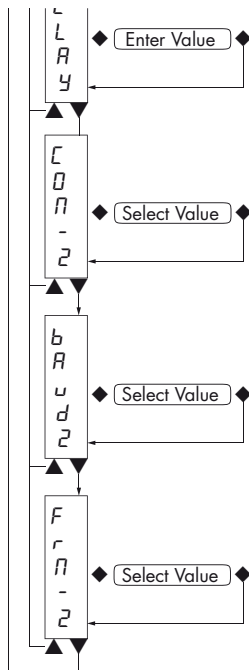
dELAY **DELAYED RESPONSE OF THE SLAVE AND MODBUS RTU COM1 PROTOCOLS**

Value in milliseconds, representing the delay of the instrument when sending the response to the request of the master.

Values: from 0 to 999

Default: 000





COM2 COM2

Definisce la modalità d'uso della porta seriale ETHERNET.

None: Comunicazione ETHERNET disattivata

Contn: Trasmissione continua della stringa di peso. Può essere utilizzato ad esempio per pilotare un ripetitore di peso. Vedi dettagli in apposito paragrafo.

Deman: Quando l'operatore preme il relativo tasto frontale o tramite Input 2, viene trasmessa una stringa di peso. Il comando viene accettato se il peso è stabile. Tra due trasmissioni successive il peso deve subire una variazione pari almeno al parametro "Delta peso".

Autom: Viene trasmessa automaticamente una stringa di peso quando il peso si stabilizza ad un valore superiore alla pesata minima (20 divisioni). Tra due trasmissioni successive il peso deve subire una variazione pari almeno al parametro "Delta peso".

Slave: Protocollo ASCII. Vedere dettagli in apposito paragrafo.

Modbs: Protocollo MODBUS TCP (slave). Vedi dettagli nell'apposito paragrafo.

Valore:

None

Contn

Deman

Autom

Slave

Modbs

Default: Modbs

bRud2 BAUD RATE COM2

Definisce il baud rate della porta ETHERNET.

Il valore deve essere impostato allo stesso valore del PC/PLC.

Valore:

2400

4800

9600

19200

38400

57600

115200

Default: 9600

F r n - 2 **FORMATO DATI COM2**

Definisce il formato dati della porta seriale.

Il valore deve essere impostato allo stesso valore del PC/PLC o del visualizzatore remoto.

In caso di protocollo SLAVE o MODBUS le selezioni dei formati dati a 7 bit (E-7-1 e O-7-1) non sono accettate (messaggio di errore "Nvalid").

Valori selezionabili:

N-8-1

N-8-2

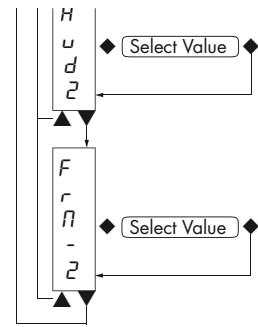
E-8-1

O-8-1

E-7-1

O-7-1

Default: N-8-1



SERIAL COMMUNICATION PROTOCOLS

CONTINUOUS, AUTOMATIC AND MANUAL TRANSMISSION PROTOCOL

These protocols have been programmed into their programming menu.

The string transmitted is as follows:

| | | | | | |
|-----|---------|----------|-----|----------|-----|
| STX | <state> | <weight> | ETX | <chksum> | EOT |
|-----|---------|----------|-----|----------|-----|

Where

STX (start of text) = 0x02h

ETX (end of text) = 0x03h

EOT (end of transmission) = 0x04.

<state> = character encoded as per the following table (bit = 1 if condition TRUE)

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|-------|-------|-------|-------|--------------|-----------|---------------|-------------|
| 0 | 0 | 1 | 1 | Tare entered | Zero band | Stable weight | Zero center |

<weight> = field consisting of 8 ASCII characters with the weight value justified on the right. (without leading zeros, with possible decimal point and negative sign).

The weight value transmitted can be the net weight, the gross weight or the peak value based on the selection of the transmitted data (MODE parameter) in the setting menu of the serial communication ports (see relevant paragraph).

Under conditions of overload, the weight field assumes the value: "^^^^^^^".

Under conditions of underload (negative weight greater than 99999), the weight field assumes the value: " _ _ _ _ _ _ _ _".

In reading error conditions, the weight field assumes the value: " O-L".

<csum> = checksum of the string data. It is calculated by performing the exclusive OR (XOR) of all characters from STX (or from <ind>) to ETX excluded the latter; the result of the XOR is decomposed into 2 characters by considering separately the upper 4 bits (first character) and lower 4 bits (second character); the 2 characters obtained are then ASCII encoded (example: XOR = 5Dh; <csum> = "5Dh" namely 35h and 44h).

In the case of continuous communication protocol, the given string is transmitted at a frequency of 10 Hz, regardless of the weight filter selected.

In the case of automatic and manual communication protocols, between 2 consecutive weight transmissions, they must undergo a corresponding change to the value set in DELTA parameter, in the setup menu of weighing parameters (see relevant paragraph).

SLAVE TRANSMISSION PROTOCOL

LIST OF THE CONTROLS AVAILABLE:

- Request of the current gross weight.
- Request of the current net weight.
- Request of the current peak value.
- Control of self-calibration.
- Control of semi-automatic zero.
- Control to reset the peak value.

The unit connected to the instrument (typically a personal computer) acts as a MASTER and is the only unit that can start a process of communication.

The process of communication must be made by the transmission of a string by the MASTER, followed by a reply from the SLAVE concerned.

CONTROLS FORMAT DESCRIPTION:

The double quotes enclose constant characters (observe upper and lower case); the <and> symbols contain variable numeric fields.

REQUEST OF THE CURRENT GROSS WEIGHT

Master: <Addr> "L" EOT

DAT 200: <Addr> "L" <status> <gross> ETX <checksum> EOT

REQUEST OF THE CURRENT NET WEIGHT

Master: <Addr> "N" EOT

DAT 200: <Addr> "N" <status> <net> ETX <checksum> EOT

REQUEST OF THE CURRENT PEAK VALUE

Master: <Addr> "P" EOT

DAT 200: <Addr> "P" <status> <peak> ETX <checksum> EOT

CONTROL OF SELF-CALIBRATION

Master: <Addr> "A" EOT

DAT 200: <Addr> "A" ACK EOT

CONTROL OF SEMI-AUTOMATIC ZERO

Master: <Addr> "Z" EOT

DAT 200: <Addr> "Z" ACK EOT

CONTROL TO RESET THE PEAK VALUE

Master: <Addr> "X" EOT

DAT 200: <Addr> "X" ACK EOT

In the case of communication error or otherwise unrecognized command from DAT 200, it will respond with the following string:

DAT 200: <Addr> NAK EOT

FIELDS DESCRIPTION

The double quotes enclose constant characters (observe upper and lower case); the <and> symbols contain variable numeric fields.

STX (start of text) = 0x02h,

ETX (end of text) = 0x03h,

EOT (end of transmission) = 0x04h,

ACK (acknowledgment) = 0x06h,

NAK (No acknowledgment) = 0x15h.

<Addr> = Serial communication address + 0x80h (i.e., address 2: <Addr> = 0x82h (130 decimal number)).

<status> = character encoded as per the following table (bit = 1 if condition TRUE)

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|-------|-------|-------|-------|--------------|-----------|---------------|-------------|
| 0 | 0 | 1 | 1 | Tare entered | Zero band | Stable weight | Zero center |

<gross>, <net>, <peak> = field consisting of 8 ASCII characters with the weight value justified on the right (no leading zeros, with possible decimal point and negative sign).

Under conditions of overload, the weight field assumes the value: "^^^^^^^".

Under conditions of underload, the weight field assumes the value: " _ _ _ _ _ _ _ _".

In reading error conditions, the weight field assumes the value: " O-L".

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|-------|-------|-------|-------|-------|-------|----------|----------|
| 0 | 0 | 1 | 1 | 0 | 0 | not used | not used |

<csum> = checksum of the string data. It is calculated performing the exclusive OR (XOR) of all characters from STX (or from <ind>) to ETX excluded the latter; the result of the XOR is decomposed into 2 characters considering separately the upper 4 bits (first character) and lower 4 bits (second character); the 2 characters obtained are then ASCII encoded (example: XOR = 5Dh; <csum> = "5Dh" namely 35h and 44h).

MODBUS RTU PROTOCOL

WARNINGS: The addresses listed in the tables below follow the standard routing specified in the reference guidelines of the Modicon PI-MBUS-300 Rev.J (www.modbus.org), referred to below is an excerpt that helps the user to communicate with the instrument.

"All data addresses in Modbus messages are referenced to zero. The first occurrence of a data item is addressed as item number zero. For example:

The coil known as 'coil 1' in a programmable controller is addressed as coil 0000 in the data address field of a Modbus message.

Coil 127 decimal is addressed as coil 007E hex (126 decimal).

Holding register 40001 is addressed as register 0000 in the data address field of the message. The function code field already specifies a 'holding register' operation. Therefore the '4XXXX' reference is implicit."

The values of the registers with address greater than 40100 are permanently stored in memory only after the data save command (see Command Register table). If this function is not performed by turning off the instrument, it will return to the value before the change.

If not otherwise specified, the numerical values (such as addresses, codes and data) are expressed as decimal values.

COMMUNICATION ERRORS HANDLING

In case of MODBUS RTU, the communication strings are controlled by the CRC (Cyclic Redundancy Check). In the case of a communication error, the slave does not respond with a string. The master must consider a timeout for the receipt of the response. In case of no answer there is a communication error.

RECEIVED DATA ERROR HANDLING

In the case of string received correctly, but that cannot be executed, the slave responds with an EXCEPTION RESPONSE according to the following table.

| Code | Description |
|------|---|
| 1 | ILLEGAL FUNCTION (The function is not valid or not supported) |
| 2 | ILLEGAL DATA ADDRESS (The address of the specified data is not available) |
| 3 | ILLEGAL DATA VALUE (The received data have invalid value) |

SUPPORTED FUNCTIONS

- FUN 03 READ HOLDING REGISTER
- FUN 06 WRITE SINGLE REGISTER
- FUN 16 WRITE MULTIPLE REGISTERS

LIST OF THE MODBUS PROTOCOL HOLDING REGISTERS

| Address | Holding Register | R/W | Format | Notes |
|---------|--------------------------|-----|--------|---|
| 40001 | Status Register | R | INT | See Table A. |
| 40002 | Gross weight (MSB) | R | INT | |
| 40003 | Gross weight (LSB) | R | INT | |
| 40004 | Net weight (MSB) | R | INT | |
| 40005 | Net weight (LSB) | R | INT | |
| 40006 | Peak (MSB) | R | INT | |
| 40007 | Peak (LSB) | R | INT | |
| 40501 | Data Register (MSB) | W | INT | Writing before or with the same query of Command Register. |
| 40502 | Data Register (LSB) | W | INT | Writing before or with the same query of Command Register. |
| 40503 | Command Register | W | INT | See Table B page 27. |
| 41001 | Load cell capacity (MSB) | R/W | INT | |
| 41002 | Load cell capacity (LSB) | R/W | INT | |
| 41003 | Load cell Sensitivity | R/W | INT | |
| 41004 | Weight division value | R/W | INT | See Table C page 27. |
| 41101 | Weight filter factor | R/W | INT | |
| 41102 | Weight stability factor | R/W | INT | |
| 41103 | Auto-zero at power ON | R/W | INT | |
| 41104 | Auto-zero at power ON | R/W | INT | |
| 41105 | Zero tracking factor | R/W | INT | |
| 41106 | Zero band | R/W | INT | |
| 41107 | Weight Delta | R/W | INT | |
| 42000 | Monitor register | W | INT | The programmed value is automatically copied to Monitor Register (42100). |
| 42100 | Monitor register | R | INT | |

TABLE A: STATUS REGISTER

| BIT | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |
|-------------|----------|----------|----|----|----|----|-------------|----------|
| Description | Not used | Not used | 0 | 0 | 0 | 0 | Memory Flag | Not used |

| BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------|--------------|-----------|------------|--------------|-----------|---------------|----------------|
| Description | Not calibrated | Wrong weight | Over-load | Under-load | Tare entered | Zero band | Stable weight | Center of Zero |

WARNING: bits 13, 12, 11 and 10 are always 0.

TABLE B: COMMAND REGISTER

| Register value | COMMAND REGISTER FUNCTION | DATA REGISTER FUNCTION |
|----------------|---|------------------------|
| 0x0001 | Semiautomatic zero | - |
| 0x0002 | Self-calibration | - |
| 0x0003 | Peak reset | - |
| 0x0010 | Calibration of the weight zero | - |
| 0x0011 | Calibration of the full weight scale | sample weight |
| 0x0020 | Saving the data in the permanent memory | - |
| 0x7FFF | Direct access memory | |

Warning: the value entered in the Command Register is always active until you write again 0x0000.

| Address | Data stored in memory with command 0x0020 |
|-------------|---|
| 41001-41002 | Load cells capacity |
| 41003 | Load cells sensitivity |
| 41004 | Weight division value |
| 41101 | Weight filter factor |
| 41102 | Weight stability factor |
| 41103-41104 | Auto-zero SET POINT |
| 41105 | Zero tracking factor |
| 41106 | Zero band |
| 41107 | Weight Delta |

TABLE C: DIVISION VALUE

| 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 |

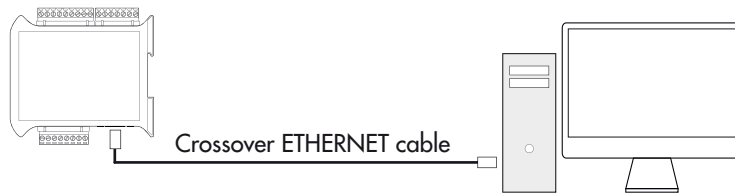
| Register value | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|----------------|-----|-----|-----|----|----|----|----|----|----|
| Division value | 0.1 | 0.2 | 0.5 | 1 | 2 | 5 | 10 | 20 | 50 |

ETHERNET INTERFACE CONFIGURATION

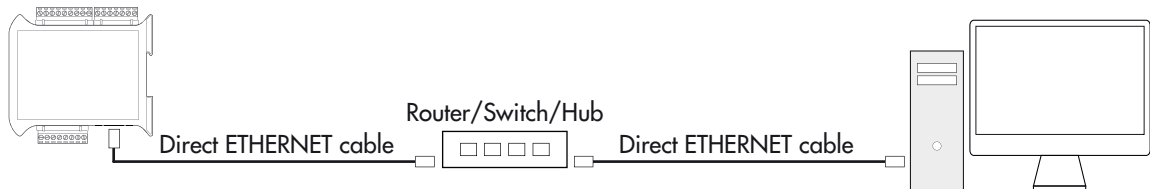
To configure the Ethernet interface it is necessary to use the PC application " TCPBridge Configurator" supplied with the instrument. To install the application, run the "setup.exe" file and follow the installation wizard .

Connect the DAT 200 to the PC according to the two procedures:

1. Direct connection by using special ethernet cable called "cross" or "crossover".



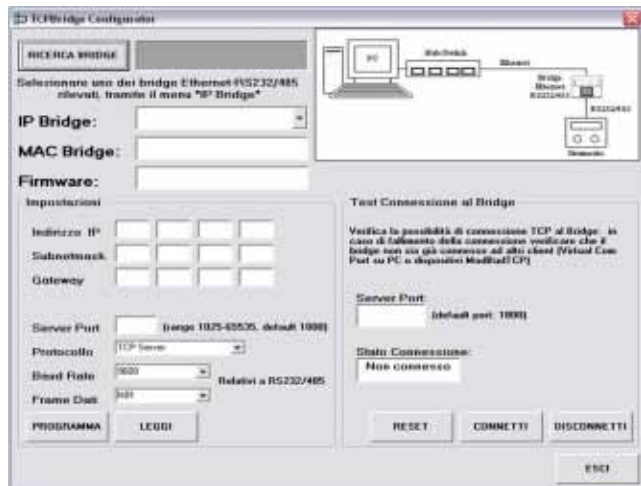
2. Connection to a LAN Network (Local Area Network) using ethernet "direct" cables . In this case, the instrument must be connected to a network device (router , switch or hub) to access the LAN.



From the Programs menu, select the application " Configurator " , under " TCPBridge Configurator " . You will see the screen as shown in the image here.

It may not be possible to immediately establish a connection with DAT 200/Ethernet. This may be due to an incompatibility between the programmed IP address by default on DAT 200/ Ethernet LAN and the network in which the device is installed for the first time. The IP addresses of devices on a LAN must adhere to a certain format. Check in the PC "network connection" (Control Panel - > Network Connections) the format of your IP address.

To configure the Ethernet interface of the instrument DAT 200, follow the steps below .



SEARCH DEVICES

To perform a search for devices DAT 200/Ethernet on the network, press the "RICERCA BRIDGE". Each device detected in the network can be selected from the drop down "IP Bridge" menu; in addition to that by selecting a specific device, it displays its MAC address and the version of the firmware loaded on the device.

Select the device you want to configure.

To avoid communication problems, the application buttons are disabled during the search of the devices.

PARAMETERS CONFIGURATION

After selecting the device you want to configure, perform the function reading of the parameters currently programmed in the device. To perform this function, use the "LEGGI" key, after a few seconds the configurable parameters (see image at right) will be updated with the values stored in the device at the time of the request.

These are the programmable parameters:

- **IP Address:** address of the device DAT 200, four numerical values (values between 0 and 255, mandatory field).
- **Subnet Mask:** four numerical values (values between 0 and 255, this parameter can be omitted or set to 0).
- **Gateway:** four numerical values (values between 0 and 255, this parameter can be omitted or set to 0).
- **Server Port:** communication port for TCP / IP, numeric value between 1025 and 65535. This value has different meanings depending on the selected protocol:
- **Protocol:** the device can be configured to operate in two different modes:
 1. TCP Server: Select this protocol if DAT 200/Ethernet (Server) must wait to receive TCP connections from other devices in the network (Client).
 2. Modbus TCP Server: Select this protocol if DAT 200/Ethernet (Server) must wait to receive TCP connections from other devices in the network (Client), which use the MODBUS TCP communication protocol.
- **Baud Rate:** This value must match the parameter "BAUD2" selected in the instrument DAT 200 (refer to the paragraph on page 20 of this manual, default 9600).
- **Frame Data:** This value must match the parameter "FRM-2" selected in the instrument DAT 200. Following the execution of the automatic reset function, the parameter values stored in the device no longer appear on your PC "TCP Bridge Configurator" (PWIN41), repeat the procedure for searching the device and the reading function of the parameters to check the correct storing of parameters.

The image shows two screenshots of the TCP Bridge Configurator software. The top screenshot displays the 'Ricerca Bridge' (Search Bridge) window, which has found one bridge (Bridge trovato: 1) with the following details: IP Bridge: 192.168.0.150, MAC Bridge: 00:04:A3:00:00:01, and Firmware: PETH0109. The bottom screenshot shows the 'Impostazioni' (Settings) window, where the IP address is set to 192.168.0.150, Subnetmask to 255.255.255.0, Gateway to 192.168.0.1, Server Port to 1800, Protocol to TCP Server, Baud Rate to 9600, and Frame Data to 9101. The 'LEGGI' (Read) button is highlighted.

TCP TEST CONNECTION

In case of "TCP Server" or "Modbus TCP Server" protocol, you can test the connection directly via the "TCPBridge Configurator" PC application (PWIN41). This function can not be performed in case of "TCP Client" protocol. Manually enter the "Server Port" parameter, or use the reading parameters function described on the previous page.

The "Server Port" parameter indicates the "TCP port" available by DAT 200/Ethernet (Server) on which the "TCPBridge Configurator" PC application (Client) can establish a TCP connection.

Press the "CONNECT" key to establish a TCP connection with DAT 200/Ethernet. The connection status is displayed in the "Stato Connessione" section. To end a TCP connection press the "DISCONNETTI" button.

DAT 200/Ethernet can accept and maintain only one connection; before the test of the connection make sure that other client devices in the network are not associated with DAT 200/Ethernet.

If the TCP connection test is successful (Stato Connessione: Connesso), the device DAT 200 is ready to be used. The communication protocol selected by parameter "COM-2" (refer to the paragraph on page 20 of this manual) is available on the Ethernet interface of the device DAT 200.

The reset function of the ethernet interface of the instrument DAT 200 can be performed at any time (for example in case of problems during testing of the TCP connection or when programming parameters), using the appropriate "RESET" button. This function does not reset the instrument DAT 200, but only its Ethernet interface.

Test Connessione al Bridge

Verifica la possibilità di connessione TCP al Bridge: in caso di fallimento della connessione verificare che il bridge non sia già connesso ad altri client (Virtual Com Port su PC o dispositivi ModBusTCP)

Server Port:
 (default port: 1800)

Stato Connessione:

RESET CONNETTI DISCONNETTI

TROUBLESHOOTING

| PROBLEM | POSSIBLE CAUSE | SOLUTION |
|--|---|--|
| The display shows the O-L message | The weight is not detectable because the cell is absent or incorrectly connected | Check the connections of the cells. |
| The display shows the hyphen in the upper display | The weight cannot be shown because it exceeds the available five digits or is greater than the capacity of the cells. | |
| The display shows the underscore on the lower display. | The weight cannot be shown because negative, more than -9999. | |
| The number of decimal places is wrong. | Incorrect division value selected. | Select the correct division value in the main menu. |
| The serial communication does not work properly. | Installation wrong. The selection of the operation of the serial interface is incorrect. | Check the connections as described in the installation manual. Select the settings as appropriate. |
| The function of semiautomatic zero doesn't work. | The gross weight exceeds the action limit of semi-automatic zero. The weight doesn't stabilize. | To re-establish the zero, calibrate the weight. Wait for the stabilization of the weight or adjust the weight filter parameter. |
| The semiautomatic tare function does not work. | The gross weight is negative or exceeds the maximum capacity. The weight doesn't stabilize. | Check the gross weight. Wait for the stabilization of the weight or adjust the weight filter parameter. |

EU Declaration of conformity (DoC)

We

Pavone Sistemi S.r.l.
Via Tiberio Bianchi, 11/13/15
20863 Concorezzo, MB

declare that the DoC issued under our sole responsibility and belongs to the following product:

Apparatus model/Product: **DAT 200**
Type: Weighing instrument

The object of the declaration described above used as indicated in the installation manual and use, is in conformity with the relevant Union harmonisation legislation:

Directive **EMC 2014/30/EU** Electromagnetic Compatibility

The following harmonized standards and technical specification have been applied:

EN 61000-6-2:2005
EN 61000-6-3:2007 + A1 2011

Directive **LVD 2014/35/EU** Low Voltage Directive

The following harmonized standards and technical specification have been applied:

EN 61010-1:2011

Signed for end on behalf of:

Concorezzo: 16/01/2017

Di Reda Donato - Manager





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