TECHNICAL MANUAL

DAT 200 Serial and Fieldbus weighing Indicator/Trasnmitter

Software version PW314

Pavone Sistemi
pesatura elettronica industriale

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Rel ID 1173003 SW 0.1

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 swithced 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.

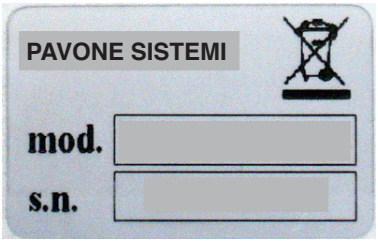
The DAT 200 use RS232 serial port with ASCII and Modbus RTU protocols to be connected to PC, PLC and remote units.

The presence of the most common fieldbus, also allows interfacing the transmitter with any supervision device currently offered by the market.

FIELDBUS AVAILABLE:

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

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 ±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, ETHERCAT, ETHERNET IP, PROFINET
In compliance with the standards	EN61000-6-2, EN61000-6-3 for EMC EN61010-1 for Electrical Safety UL: FILE NO E474362

INSTALLATION

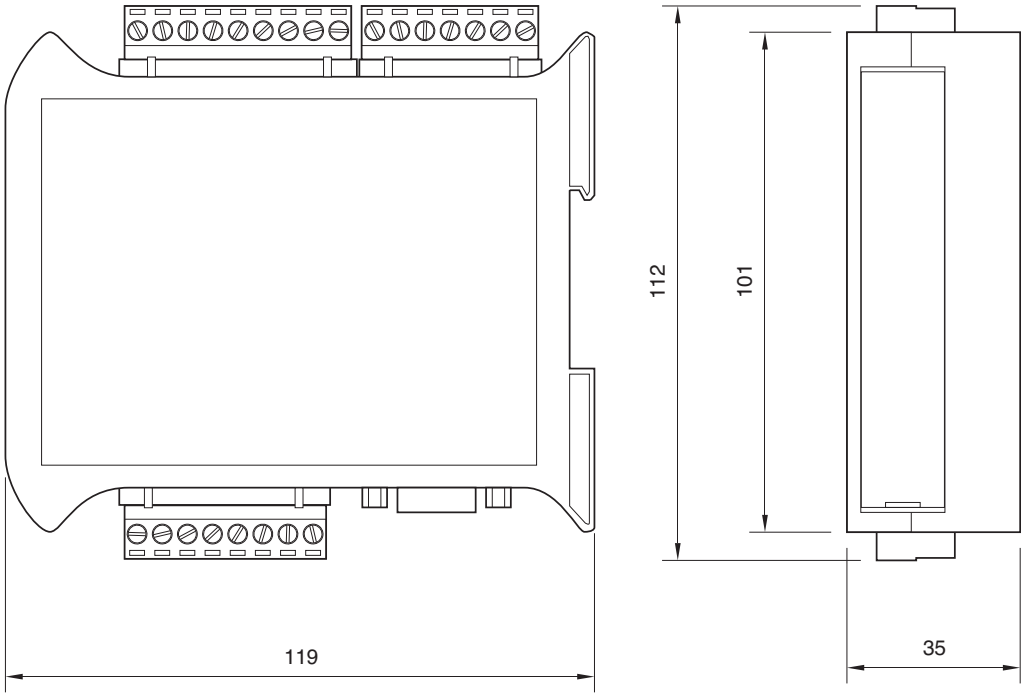
GENERAL INFORMATION

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.

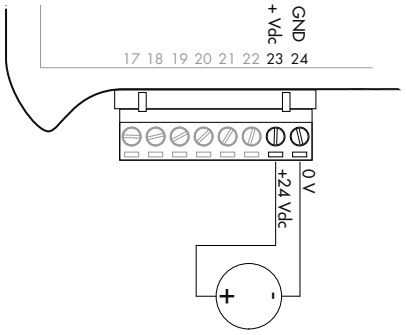
The load cell cable must be shielded and channeled away from power cables to prevent electromagnetic interferences.

INSTRUMENT POWER SUPPLY

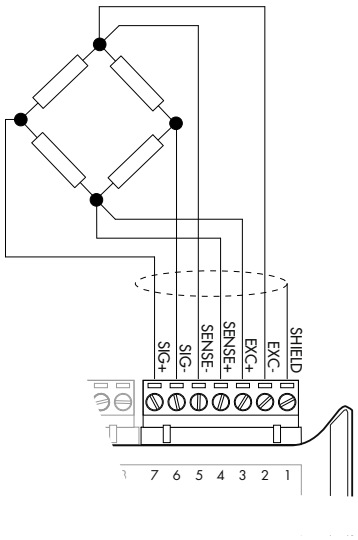
The instrument is powered through the terminals 23 and 24. The power supply cable must be channeled separately from other cables.

The internal circuit is galvanically isolated from the supply voltage.

Power supply voltage: 24 Vdc± 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.

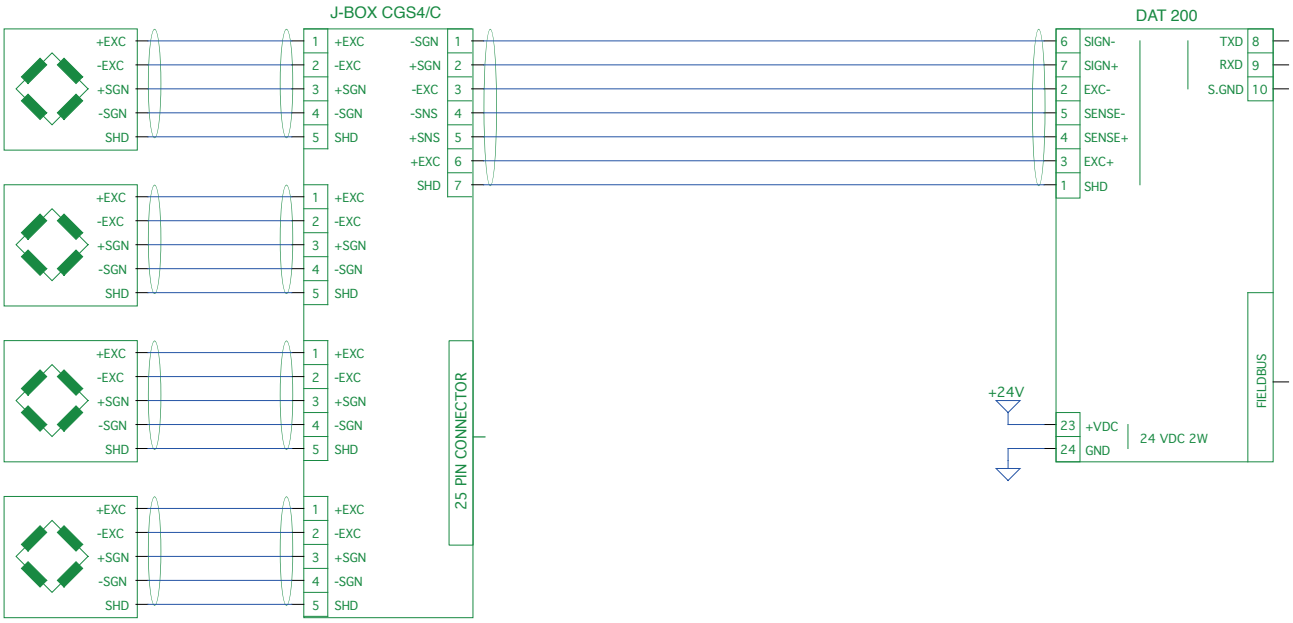
The instrument can be connected up to maximum 4 load cells of 350 ohm in parallel. The supply voltage of the load cells is 4 Vdc and is protected by temporary short circuit.

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.

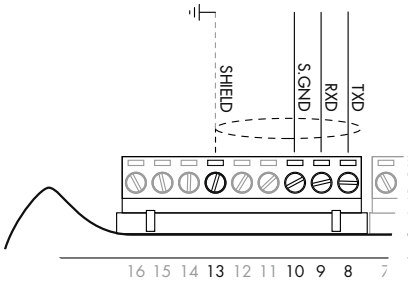
Connect the cell cable shield to the terminal 1.

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.

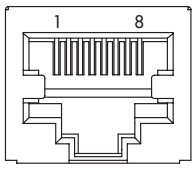
The cable must not be channeled with power cables, maximum length of 15 meters (EIA RS-232-C).

FIELDBUS CONNECTIONS

As an alternative to the RS485 serial port some of the most common fieldbuses are available. You can use a single fieldbus which must be specified when ordering.

ETHERNET CONNECTION

On the lower left part of the instrument there is a RJ45 connector for Ethernet.



1 TX+
2 TX-
3 RX+
6 RX-

Features:

Trasmission speed 10 Mbps

Network compatible with 10/100/1000 Base-T

TCP Ethernet protocols, Modbus/TCP, UDP, IP, ICMP, ARP

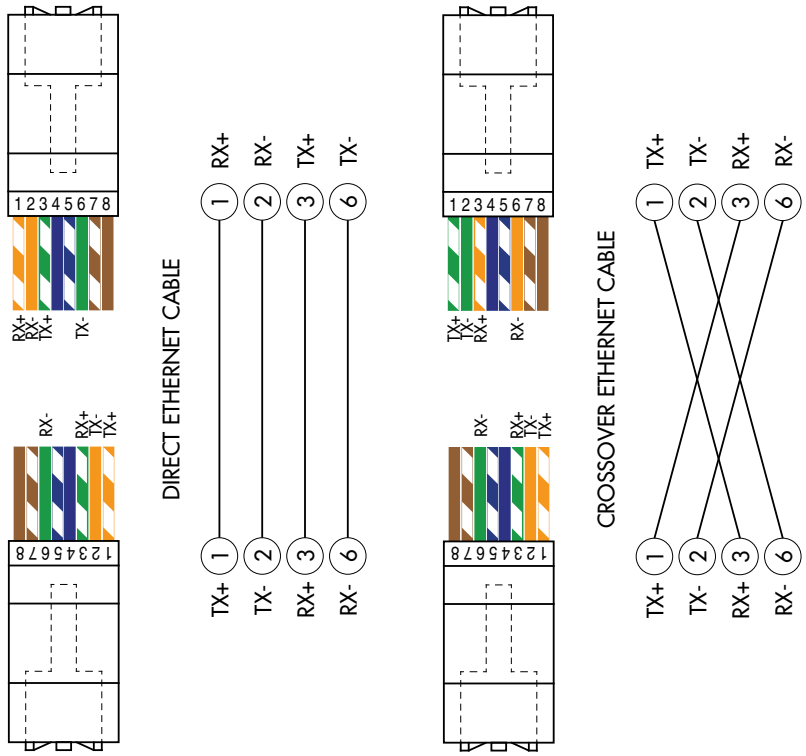
TCP server communication mode

LED indicators (2) Presence of Ethernet and communication/diagnostics line

Buffer size 256 bytes

Connection Time-out Min 30 seconds - Max 90 seconds

Link Time-out (cable disconnected) 30 seconds



PIN	DESCRIPTION
1	TX+
2	TX-
3	RX+
4	
5	
6	RX-
7	
8	

To connect to the MASTER, use a standard twisted pair Ethernet cable with RJ45 connector.

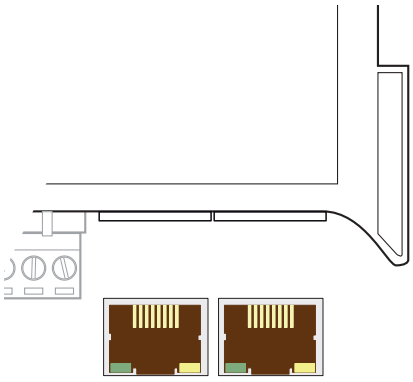
The RJ45 Ethernet connection cable has a variable maximum length, depending on the type of cable. A common Cat5 shielded cable can have a maximum length of about 180 m.

• You can connect the Ethernet communication port directly to the PC, without having to go through other network devices (routers, switches, hubs, LAN-bridge or the like), but special RJ45 cables must be used, called "crossover."

• Normally cables are the “direct” type and allow connection to network devices such as routers or hubs, but not direct connection to two PCs (even if there are currently network cards with auto-sensing technology, which recognize the type of cable and the type of connection, allowing direct PC-PC connections as well as using non cross-over cables).

• On side are diagrams of the two types of cables mentioned and their connection diagram.

ETHERNET / IP CONNECTION



Ethernet / IP is a real-time industrial protocol which is based on the Ethernet network.

There are two RJ45 connectors to allow connection of multiple instruments in the same network.

Refer to the previous page for connection notes and warnings.

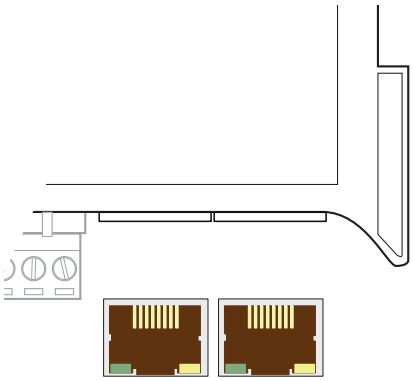
Features:

10 and 100 Mbit operation, Full and Half Duplex

Modbus-TCP server

Up to 128 bytes of I / O fieldbus in every direction.

PROFINET CONNECTION



The Profinet connector is RJ45, the same as the Ethernet interface.

There are two RJ45 connectors to allow connection of multiple instruments in the same network.

Refer to the previous page for connection notes and warnings.

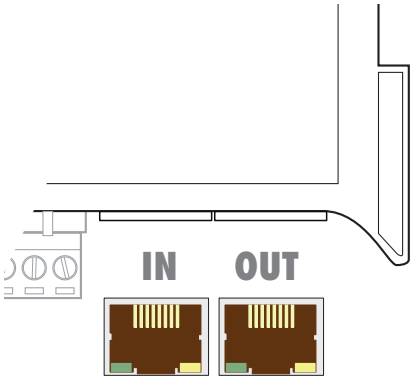
Features:

PROFINET IO Real Time (RT) communications

Modbus-TCP server

Up to 128 bytes of I/O fieldbus in every direction.

ETHERCAT CONNECTION



EtherCAT is a real-time industrial protocol which is based on the Ethernet network.

EhterCAT The protocol requires that the RJ45 connectors have the function of IN and OUT.

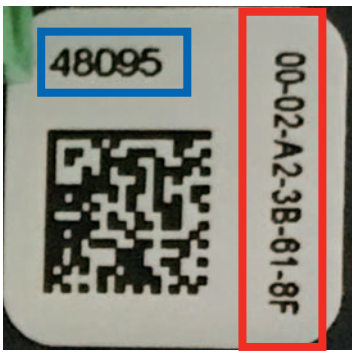
Putting more DAT 200 instruments in series, the MASTER will be connected to the IN connector of the first DAT 200, whose OUT connector will be connected to the IN connector of the next etc …

Refer to the previous page for connection notes and warnings.

MAC ADDRESS IN INSTRUMENTS WITH INDUSTRIAL FIELDBUS ETHERNET.

Instruments which install Hilscher modules with Industrial Ethernet Protocol (Profinet, EthernetIP, EtherCAT, etc.) have a label under the connectors, as shown.

This label shows the MAC address of the module (red box), the identification number of the module (blue box) and a QR code that contains the MAC address. The latter can be read using a smartphone app for reading QR codes (eg. on Google Play store, "QR Code Reader").

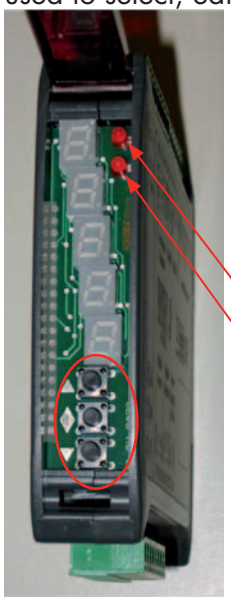


FRONT PANEL

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 theyr 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:

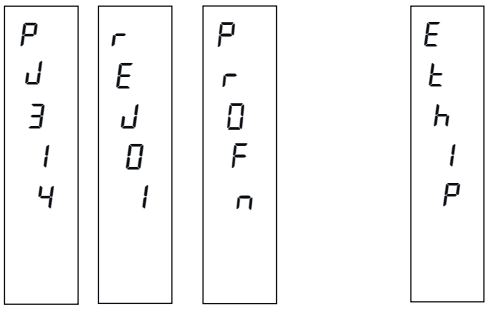
KEY	FUNCTIONS IN WEIGHT INDICATION CONDITIONS
▲	Short press: Display switches from Gross to Net weight. Long press: Display switches from Weight to Peak
◆	Short press: Display switches from Numerical to Bar-graph of to gross weight. Long press: Zeroing of the weight/peak displayed.
▼	Short press: Sending 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.

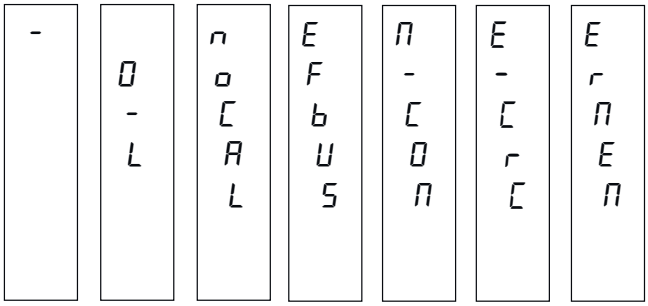


PrOFn Profinet hardware module

EthIP Profibus DP 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.

O-L O-L : No signal from the load cells or outside of the field of measurement mV/V.

noCAL NOCAL: Transmitter not calibrated. Recalibration needed.

EFbuS EFBUS: Fieldbus interface absent or not working.

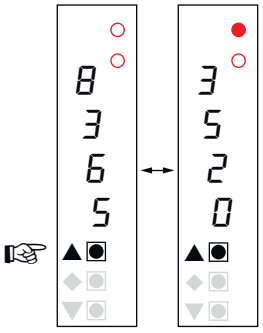
N-COM N-COM: Fieldbus interface of the instrument is not connected to the network.

E-CrC E-CRC: CRC error during communication with the fieldbus interface of the instrument.

ErNEN ERMEM: Error in E^2PROM. You can reprogram the instrument to the factory settings, erasing any calibration by pressing ◆ key.

VIEWING, ZEROING THE WEIGHT AND AUTO TARE

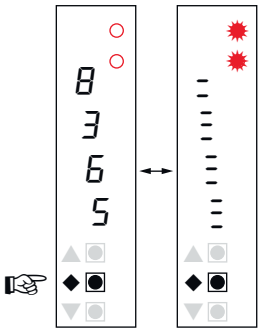
When the instrument is switched ON, the display shows the current net weight.



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.

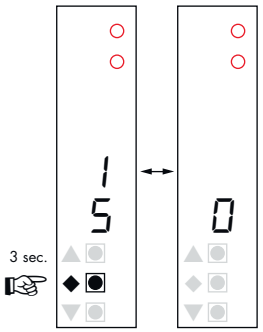
In case of negative weight, it is displayed the minus sign before the most significant digit. In case of negative weight greater than 9999, the minus sign is displayed alternatively with the most significant digit.



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.

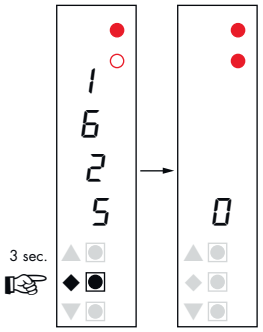
Press ◆ key for 3 seconds to zeroing gross weight.

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

Unstable weight.

Gross weight greater (positive or negative) than the 0BAND 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 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.

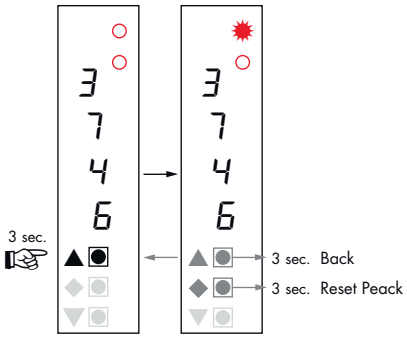
If the automatic tare is performed with gross weight = 0, the display shows again gross weight (Led 1 switched off).

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 CONFG 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.

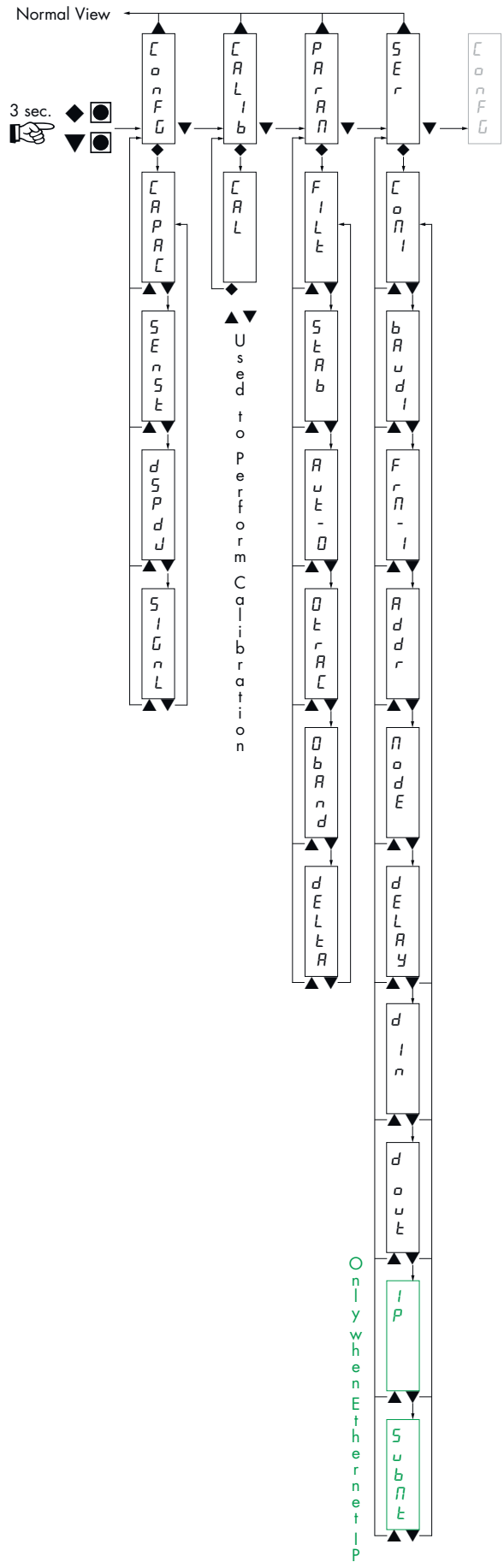
▲ key. Increment the flashing digit, select the next alternative value, goes back to the higher level or exits the setup menu.

◆ 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.

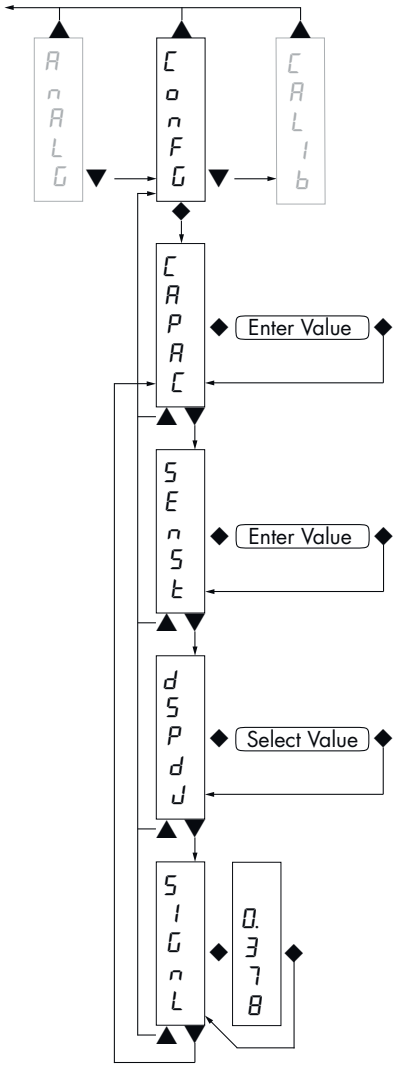
NB. To exit and save the changed data, press the ▲ button until the indicator returns to the operating mode.

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

SEnSt 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.

CALIB - CALIBRATION

The calibration method below, is used to correct or reduce the linearity error of the weighing system. The calibration should be performed with the use of sample weight or pre-weighed product on a sample weighing system.

Before proceeding with the calibration of the full scale, always perform the zero calibration.

During the calibration phase, the display shows the weight intermittently with the inscription CAL.

ATTENTION: at power off without exiting the set-up menu, the programming executed are not stored.

NB In the event that after calibration the system has linearity errors, verify that the structure weighed is completely free from mechanical constraints.

ZERO CALIBRATION

Perform the operation when the system is empty (including the fixed tare) and the weight is stable. The zero of the system is done by pressing the ▼ key. The display shows 2-0F confirming the operation.

The weight displayed resets and the display shows CAL alternated by 0. It is possible to repeat this operation more times.

CALIBRATION OF FULL SCALE

Prior F.S. calibration load the sample weight on the system and wait for the stabilization; the display shows a weight value.

Press the ▲ key to adjust the weight. The display shows 00000 with the first digit flashing.

Use the ▲ or ▼ keys, enter the weight value starting with the first digit flashing. Switch to the next digit by pressing ◆. The confirmation of the last digit performs the correction of the weight. The display shows CAL alternated to the weight entered.

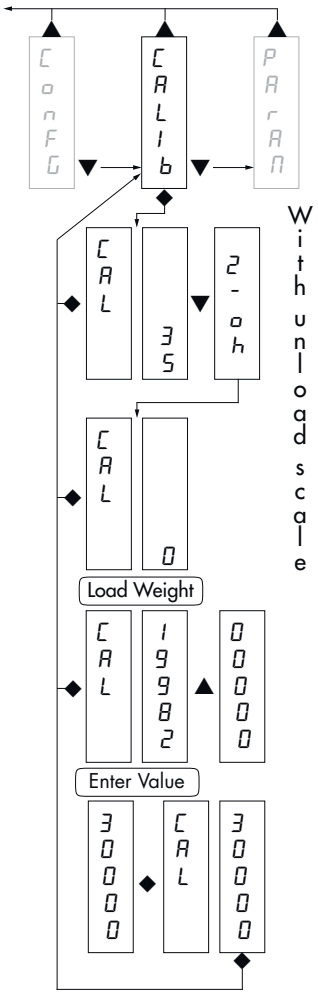
If the weight value is higher than the resolution, it is not accepted and the display shows an error message for a few seconds.

You can always repeat the F.S. calibration.

EXIT FROM CALIBRATION MENU

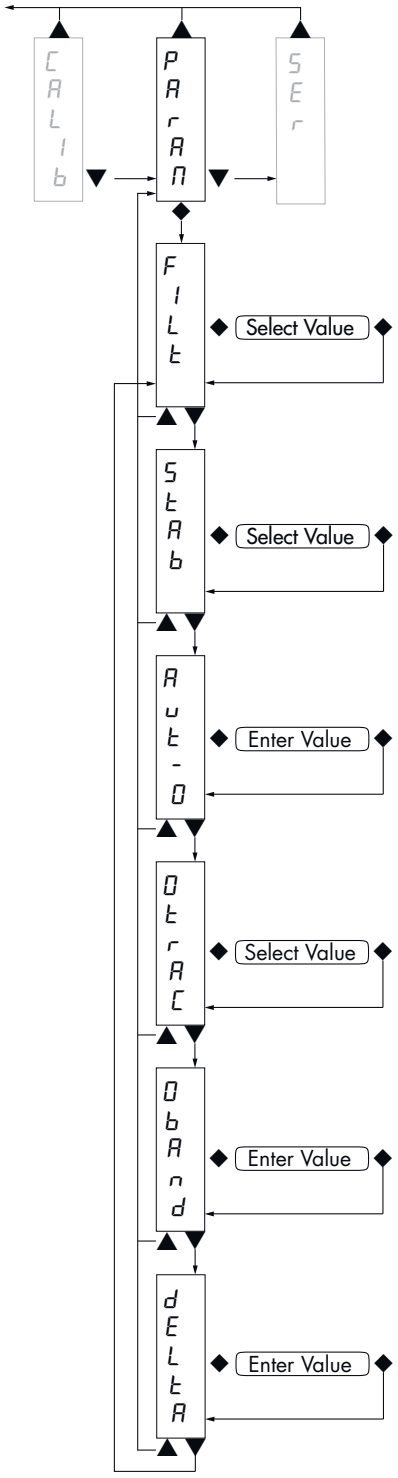
The exit from the menu CALIb is done by pressing ◆ key.

The display shows CALIb. To store the new setting and exit the setup menu, press the ▲ key.



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	*62 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	*8 Hz*	*0.4 Hz*
9	*6 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

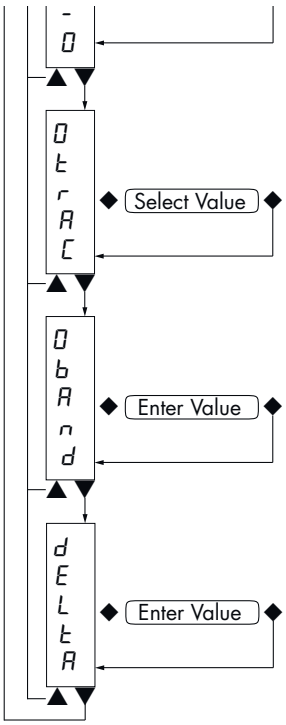
Aut-0 AUTOZERO AT POWER ON

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



0trAc **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.

Value	*Change*
0	*Control OFF*
1	*0.5 div/sec*
2	*1 div/sec*
3	*2 div/sec*
4	*3 div/sec*

Default: 0

0bAnd **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

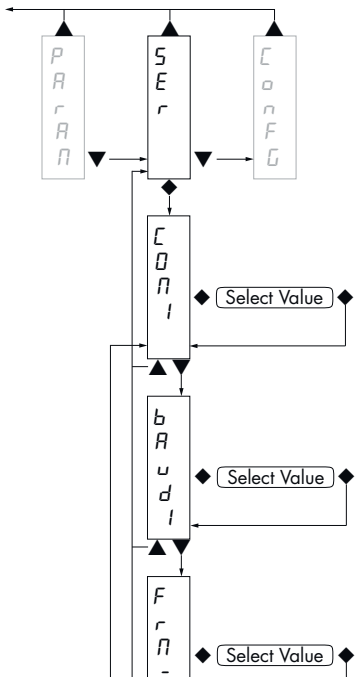
dELtA **WEIGHT DELTA**

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.

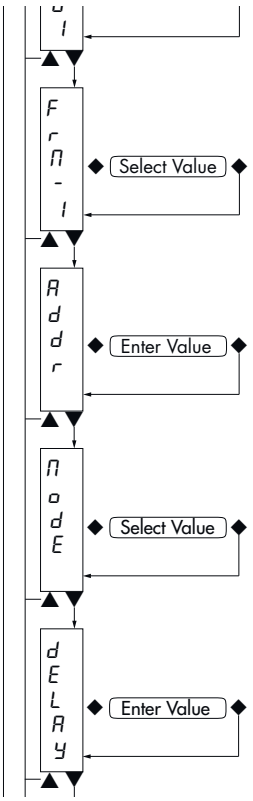
Selectable Values:
None
Contn
Deman
Autom
Slave
Modbs
Default: Modbs

bAud1 **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



Fr n- 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

0-7-1

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

nodE 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

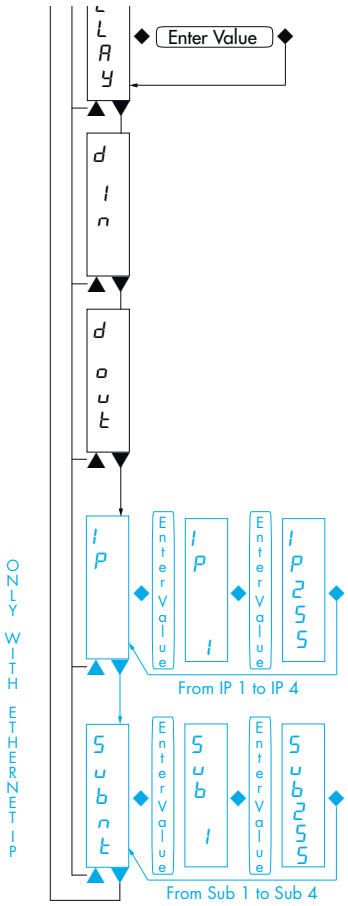
dELAY DELAYED RESPONSE OF THE SLAVE AND MODBUS RTU COM1 PROTOCOLS

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

ONLY WITH ETHERNET IP



INPUT AREA DIMENSION

Input area dimension for fieldbus (value expressed in Bytes).

In the case of PROFINET protocol this selection is only used to define how many data to send; real selection is performed by Master

Values that can be selected:
32, 64, 96, 128
Default: 128

OUTPUT AREA DIMENSION

Output area dimension for fieldbus (value expressed in Bytes).

In the case of PROFINET protocol this selection is only used to define how many data to receive; real selection is performed by Master

Values that can be selected:
32, 64, 96, 128
Default: 128

IP-Add PROGRAMMING THE IP ADDRESS

The 4 bytes that define the IP address must be programmed in sequence. In IP 1 enter via the ▲ e ▼ pushbuttons the value of the first three digits of the address. Once you have confirmed the value with the ◆ key, the display shows IP 2. Enter the value of the second group of numbers and repeat until complete insertion of the address.

Values: from 000 to 255
Default: 000

Subnt PROGRAMMING THE SUBNET MASK

The 4 bytes that define the subnet mask, must be programmed in sequence with the same methods used for programming of the IP address.

Values: from 000 to 255
Default: 000

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.
- Autotare command.
- Semi-automatic zero command.
- 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 <chksum> EOT

REQUEST OF THE CURRENT NET WEIGHT

Master: <Addr> "N" EOT

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

REQUEST OF THE CURRENT PEAK VALUE

Master: <Addr> "P" EOT

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

AUTOTARE COMMAND

Master: <Addr> "A" EOT

DAT 200: <Addr> "A" ACK EOT

SEMI-AUTOMATIC ZERO COMMAND

Master: <Addr> "Z" EOT

DAT 200: <Addr> "Z" ACK EOT

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 (acknoledgment) = 0x06h,

NAK (No acknoledgment) = 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
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.
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	Not used	Not used	Not used	Not used	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

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

FIELDBUS PROTOCOL

The following table lists the registers of the input area (produced from the instrument and read by the master), common to all PROFINET, ETHERCAT, ETHERNET / IP fieldbuses.

WARNING:

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

The input area is updated at a fixed frequency of 25 Hz.

To transfer the parameters of the Output Data Area to the DAT 200 instrument you need to enable direct access to the memory, writing the hexadecimal value 0x7FFF in the Command Register (1 word in writing) in order to avoid that the instrument resets all its variables in the case of uninitialized Output Data Area. This command must be sent before the connection to inform the instrument that the parameters have been initialized by the master. Now, the instrument continually tests the changes made to the parameters and stores them only in case of real change.

In case of ETHERCAT fieldbus: the devices will be connected with ring type (according to EtherCAT specification), refer to the installation manual for the use of INPUT and OUTPUT ports.

4 different XML configuration fileare provided:

"Hilscher NIC 50-RE V2.2 ECS Byte.xml 32" (32 bytes Input Area, 32 bytes of Output area).

"Hilscher NIC 50-RE V2.2 ECS 64 Byte.xml" (64 bytes Input Area, 64 bytes of Output area).

"Hilscher NIC 50-RE V2.2 ECS Byte.xml 96" (96 bytes Input Area, 96 bytes of Output area).

"Hilscher NIC 50-RE V2.2 ECS 128 Byte.xml" (128 bytes Input Area, 128 bytes of Output area).

In the PLC must be imported the file that matches the size of the input and output areas selected in the instrument (for example, if the instrument is set to InP.rEG.=128 and oUt.rEG.=128, the PLC has to be imported file "Hilscher NIC 50-RE V2.2 ECS 128 Byte.xml"). It could be import multiple files with different size, but in this case you can not run the automatic search function and configuration of the devices on the network.

In the case of IP ETHERNET fieldbus, the EDS configuration file "HILSCHER NIC 50-RE EIS V1.1.EDS" is provided. The size of the input and output areas set in the PLC (possible selections: 32, 64, 96 or 128 bytes) must correspond to the size of the input and output areas selected in the instrument (parameters "INP.REG." and "OUT .REG.").

In case of PROFINET fieldbus, the XML configuration file "GSDML-V2.3-HILSCHER-NIC 50-RE PNS 32-20160122.xml" is provided. The size of the input and output areas set in the PLC (possible selections: 32, 64, 96 or 128 bytes) must correspond to the size of the input and output areas selected in the instrument (parameters "INP.REG." and "OUT .REG.").

The instruments are supplied with the parameter "Profinet Name" not configured and IP address set at 0.0.0.0.

The following table lists the registers of the output area (written by the master and acquired by the instrument), common to all PROFINET, ETHERCAT, ETHERNET / IP Fieldbuses.

The registers are 16 bit in size. The registers written by the master in the output area, are read by the instrument at a fixed frequency of 25 Hz.

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

OUTPUT DATA AREA

Byte	Register address	OUTPUT AREA REGISTER	Notes
1-2	0	Data Register (MSB)	INT. value - Most significant word
3-4	1	Data Register (LSB)	INT. value - Less significant word
5-6	2	Command Register	See table B.
7-8	3	Capacity of load cells (MSB)	INT. value - Most significant word
9-10	4	Capacity of load cells (LSB)	INT. value - Less significant word
11-12	5	Sensitivity of load cells	
13-14	6	Weight division value	See table C.
15-16	7	Filter factor	
17-18	8	Weight stability	
19-20	9	Auto zero when switching on (MSB)	INT. value - Most significant word
21-22	10	Auto zero when switching on (LSB)	INT. value - Less significant word
23-24	11	Zero tracking	
25-26	12	Zero Band	
27-28	13	Delta Weight	
29-30	14	Monitor register	This value corresponds to the same register in the output area.

READING EXAMPLE

To write the set-up parameters following the example:

In the bytes 5-6 (Command Register) write value Hex 7FFF. This value opens the writing area of the DAT 200.

Example: to change the default values of the DAT 200 like the Capacity of the load cells, the Sensitivity and Division value to 15000, 2.9965 and 2

Capacity	Byte 7	Byte 8	Byte 9	Byte 10
Hex	00	00	3A	98

Sensitivity	Byte 11	Byte 12
Hex	75	0D

Division	Byte 13	Byte 14
Hex	00	0A

Save the data by writing the value Hex 20 in Command Register.

To perform Zero and FS Calibration it is not needed to abilitate the internal Writing Area of the DAT 200.

Zero Calibration:

Whit empty system put Hex 10 in Command Register (bytes 5-6). The new Zero value is stored. To de-activated the Zero Calibration command put value Hex 0 in Command Register.

Full Scale Calibration:

Put a know weight on the system and write its value in the Data Register (from byte 1 to 4). Put value Hex 11 in Command Register. The weight value will be displayed.

To store the new value put value Hex 20 in Command Register.

To end the procedure put value Hex 0 in Command Register.

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