

INDI-ISO376

Manual

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1. INTRODUCTION

INDI-ISO376 is a high performance force indicator intended for calibration systems. Its basic function is to convert the signals from strain gauge transducers to useful force information. Transducer excitation is included as well as parameter controlled signal processing, indication of output levels, error supervision and operation of optional external equipment. Two internal relays in INDI-ISO376 can be used for output functions from level supervision, setpoints, etc. or 'In process' indication, reporting the operating status of INDI-ISO376.

INDI-ISO376 has two serial communication ports and can handle options such as analogue outputs, digital inputs and outputs, external serial ports, and a fieldbus gateway. Several INDI-ISO376 units can be controlled from a master computer or PLC via a serial RS-485 communication interface using MODBUS protocol. It is also possible to load new software into INDI-ISO376 using the serial interface.

All functions in INDI-ISO376 are controlled by set-up parameters. Setting of parameter values can be performed with keys and display on the front panel, or via serial communication.

INDI-ISO376 and all external equipment are powered by 24VDC. All input and output signals are galvanically isolated from each other and from the power supply.

1.1. Functions

1.1.1. Measurement with strain gauge transducers

Both excitation voltage and output signal are measured at the transducer to avoid influence from voltage drop in the connection cable. Excitation to the transducer, from INDI-ISO376 or from an external DC-power supply, is provided over separate wires. A shielded 7-wire cable must be used to connect a distant transducer to INDI-ISO376.

1.1.2. A/D conversion

The analogue signals from the transducer are converted to digital form and filtered to give an internal transducer signal with high resolution.

1.1.3. Calculation

The transducer excitation and signal values are combined to form an internal transducer signal, representing the load on the transducer. Influenced by calibration data, this signal is converted to a digital measurement value, the force value, that can be presented at the local display window and at external equipment.

1.1.4. Error supervision

As long as the error supervision detects no error, the signal 'In process' is present but if an error is detected, 'In process' will be off and a specific error message will be displayed. 'In process' can be set to control any digital output.

1.1.5. Levels

Eight level comparators in INDI-ISO376 can be set to switch at defined signal levels with any selected hysteresis added, meaning that the switch level can be different for increasing and decreasing signal. Output signals from these comparators are available on the serial communication. The level comparator outputs can also be set to control digital outputs from INDI-ISO376 or external I/O units.

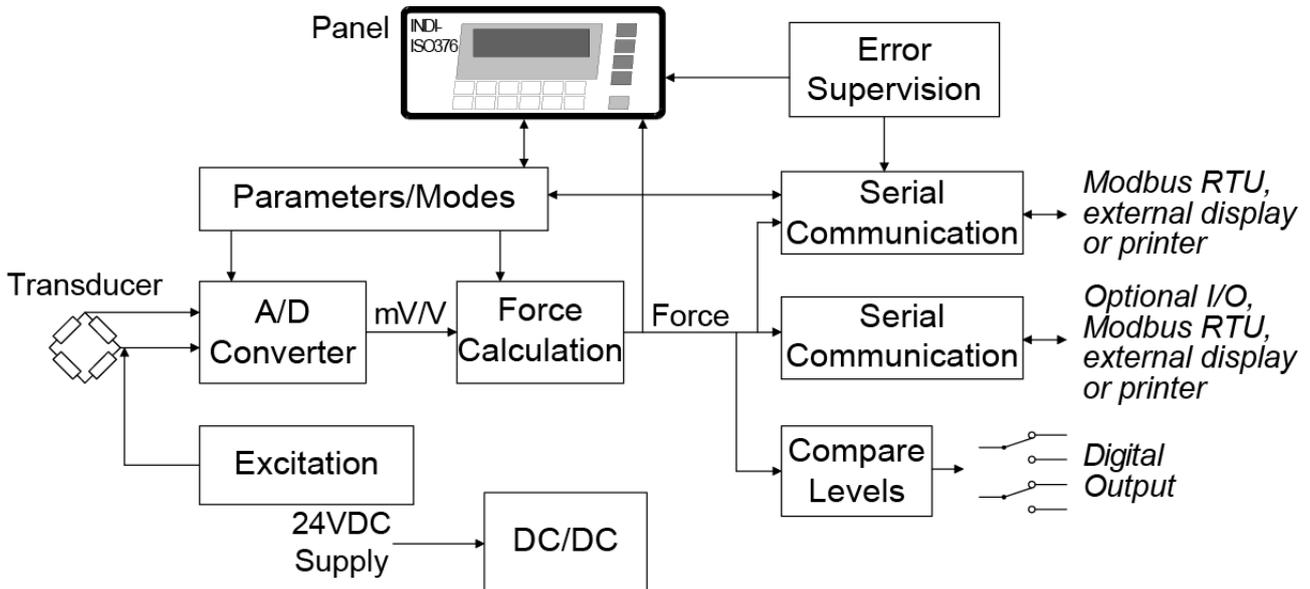


Figure 1 : The Force indicator INDI-ISO376 converts analogue transducer signals into precise measurement information, available by serial communication for use in industrial processes.

1.1.6. Serial communication

INDI-ISO376 utilizes the serial interface RS-232, or RS-485/RS-422 on 2-wires or 4-wires, for communication with control computer, optional I/O units, or other external equipment. Set-up and calibration parameter values, force values, level status, error status etc. is transmitted, using the MODBUS protocol.

1.1.7. Instrument modes

In normal operation mode INDI-ISO376 is presenting the measurement value at the front panel. For editing of the set-up parameters that control the operation, INDI-ISO376 must be switched over into set-up mode where normal measuring operations are interrupted. If an error is detected, INDI-ISO376 automatically switches over to the error mode, displaying an error message, normal measuring functions will be interrupted, all digital outputs will be deactivated, analogue outputs will be set to 0V/0 mA and the signal 'In process' will be deactivated.

1.1.8. Parameter setting

In INDI-ISO376 all operating functions are controlled by set-up parameters with numerical values, string values, or pre-selected values from a list of alternatives. Parameter set-up is performed by the keys at the front panel of INDI-ISO376, or by serial communication with MODBUS from an external control unit.

1.1.9. Presentation

INDI-ISO376 can present measured or calculated values, status of levels, parameter settings etc. at the front panel, and the values can be transferred to external equipment by serial communication. An extensive system of menus gives the possibility to present various information about the instrument.

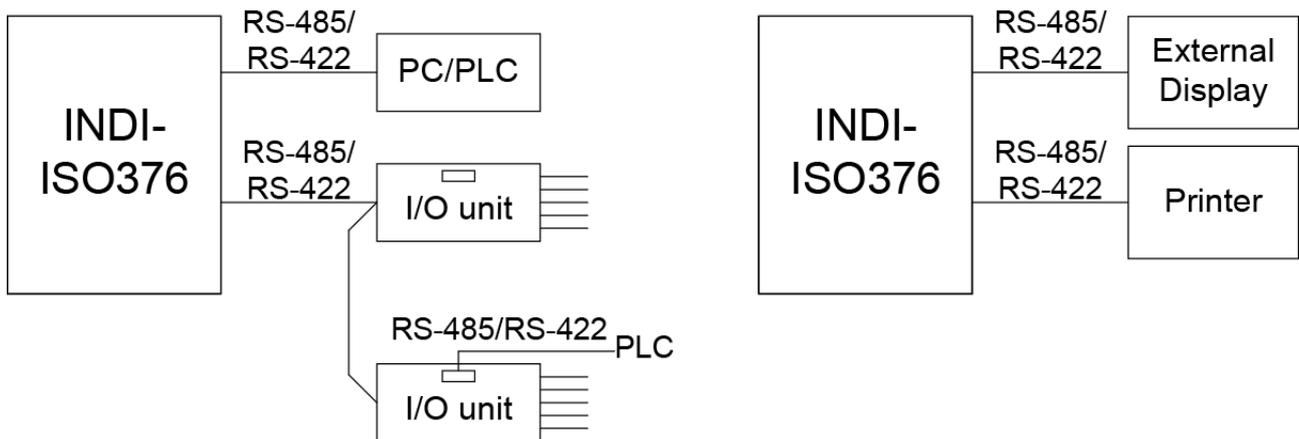


Figure 2 : INDI-ISO376 utilizes serial communication to carry out different operational tasks.

1.2. Specifications

1.2.1. Transducer input

Transducers	Max. 8, 350Ω each.
Excitation	Depending on the number of 350Ω transducers connected: 9.7VDC ±5 % with 1 transducer 9.4VDC ±5 % with 2 transducer 8.4VDC ±5 % with 3 transducer 7.6VDC ±5 % with 4 transducer 6.4VDC ±5 % with 6 transducer 5.5VDC ±5 % with 8 transducer
Signal input	Bipolar up to 3.3mV/V (optional 7mV/V)
Sensitivity	0.3μV/div (0.5μV/div at legal weighing)
Sense input	1.5 – 10VDC

1.2.2. Conversion

A/D conversion	13800000 counts. Patented own design
Temperature influence	
Gain	<± 1.5ppm/°C of shown force
Zero	<± 0.01μV/°C
Noise	<0.15μV p-p during 60s
Linearity	<± 20ppm of range
Repeatability	<± 10ppm of range
Graduation	1, 2, 5, with 0 to 3 decimals and 10, 20 or 50
Conversion	Ratiometrically integrating, 0.5 to 50 conversions per second
Resolution	10000 / 1000000 divisions (fastest / slowest conversion rate at input signal: 1.0mV/V)

Filter	Adaptive digital filter
Step response	3 – 11 updates
Fastest update rate:	50Hz
Slowest conversion rate:	0.5Hz
Linearization	Can be calibrated in 6 points

1.2.3. Serial communication, COM1

Used for Modbus RTU communication, fieldbus communication (via GATE 3), remote display or printer.

Interface	RS-485/RS-422 or RS-232 with D-sub
Baud rate	Up to 115.2kBaud
Response times:	Modbus >3ms Baud rate >38400 => >1ms
	Modbus >0.5ms
	Auto

1.2.4. Serial communication, COM2

Used for Modbus RTU communication, fieldbus communication (via GATE 3), optional I/O units, remote display or printer.

Interface	RS-485/RS-422
Baud rate	Up to 460kBaud
Response times:	Modbus >3ms Baud rate >38400 => >1ms
	Modbus >0.5ms
	Auto

1.2.5. Digital inputs

Number of	2.
-----------	----

inputs
 High voltage range 19 – 29VDC
 Low voltage range 0 – 6VDC
 Input current 6mA at 24V in

1.2.6. Relay outputs

Number of relays 2
 Relay load Max 1A, 30VAC or VDC
 Spark suppression required at inductive load

1.2.7. Calibration

Method Table

1.2.8. Calendar clock

Internal real time clock with backup battery

1.2.9. Power supply

Supply voltage 24VDC $\pm 20\%$, 8W

Keys 10 keys for digit and character entry, – sign, decimal point, ENTER, 4 function keys: Relative Zero, Absolute/relative, Print, Hold.

1.2.10. Environmental

Temperature range
 Rated performance -10 to +50°C
 Storage -25 to +85°C
 CE conformity EMC, industrial for process control.

1.2.11. Mechanical data

Front panel 100x200mm
 Panel cut-out 92x186mm, r <5mm
 Depth behind panel 135mm. Add 50mm if D-sub connector is used for RS-232
 Panel thickness Up to 10mm
 Protection IP65 at the front end by panel mounting

1.2.12. Front panel

Display 248 x 60 pixel graphic LCD with back lighting

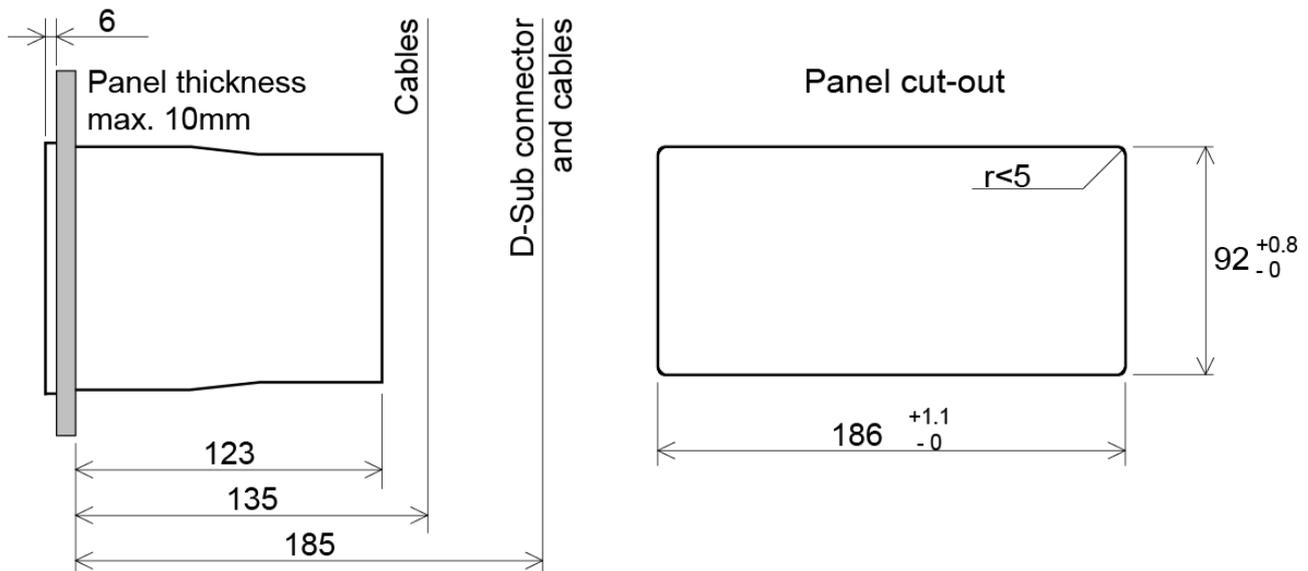


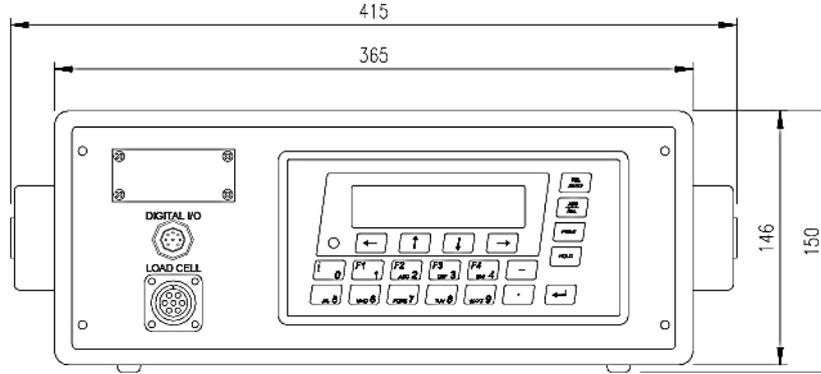
Figure 3 : Mechanical dimensions and panel cut-out for INDI-ISO376

1.3. Enclosure options

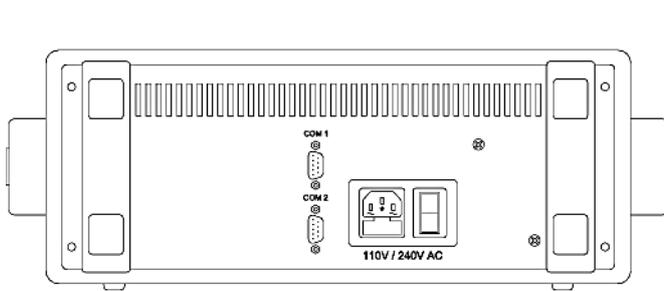
The FTS-3 may be supplied a number of different enclosure options.

- Stand-alone version for mounting in customer's own equipment. (24VDC)
- Chassis mounted version for mounting in customer's enclosure. (2VDC)

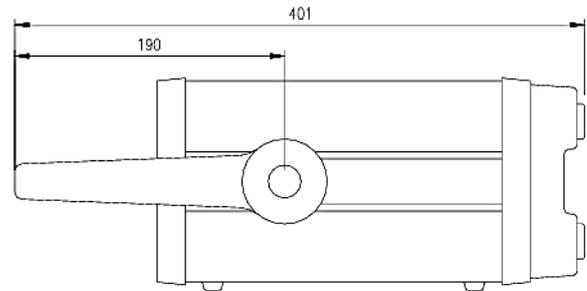
- Laboratory styled desk top case version. (110/240VAC)
- Rugged flight case version. (110/240VAC)



FRONT VIEW (HANDLE NOT SHOWN)

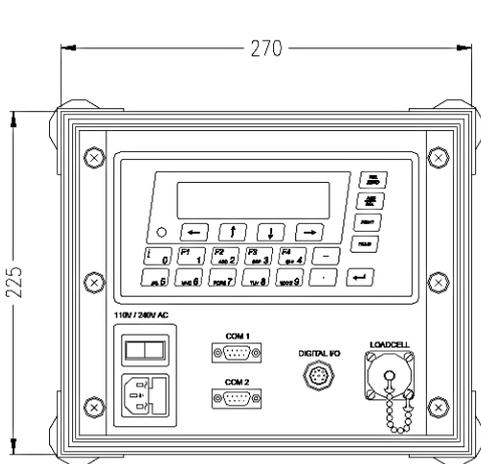


REAR VIEW (HANDLE NOT SHOWN)

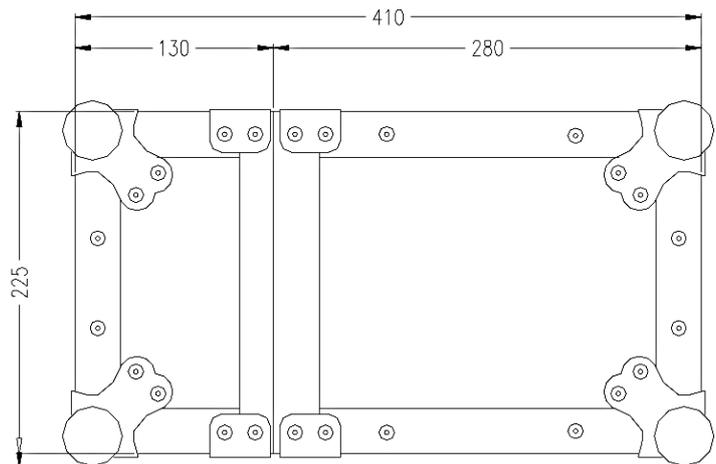


SIDE VIEW SHOWING HANDLE

Figure 4 : Mechanical dimensions for laboratory case



LID OMITTED FOR CLARITY



SIDE VIEW

Figure 5 : Mechanical dimensions for Flight case

1.4. Accessories

1.4.1. HOLD push button

A switch assembly, that connects to the digital input of the INDI-ISO376, to allow easy control of the HOLD function whilst viewing the display. Standard version plugs into the special connector on the chassis and case front panels. Longer cables are available by special order although these are not of the spiral telephone style

1.4.2. Printer

A special 40 column strip printer that connects via the COM2 port (connector at rear of laboratory case version) and allows the printing of all parameters, force values, stored prints and HOLD values is available mounted in a complimentary case.

1.5. Load cell connectors

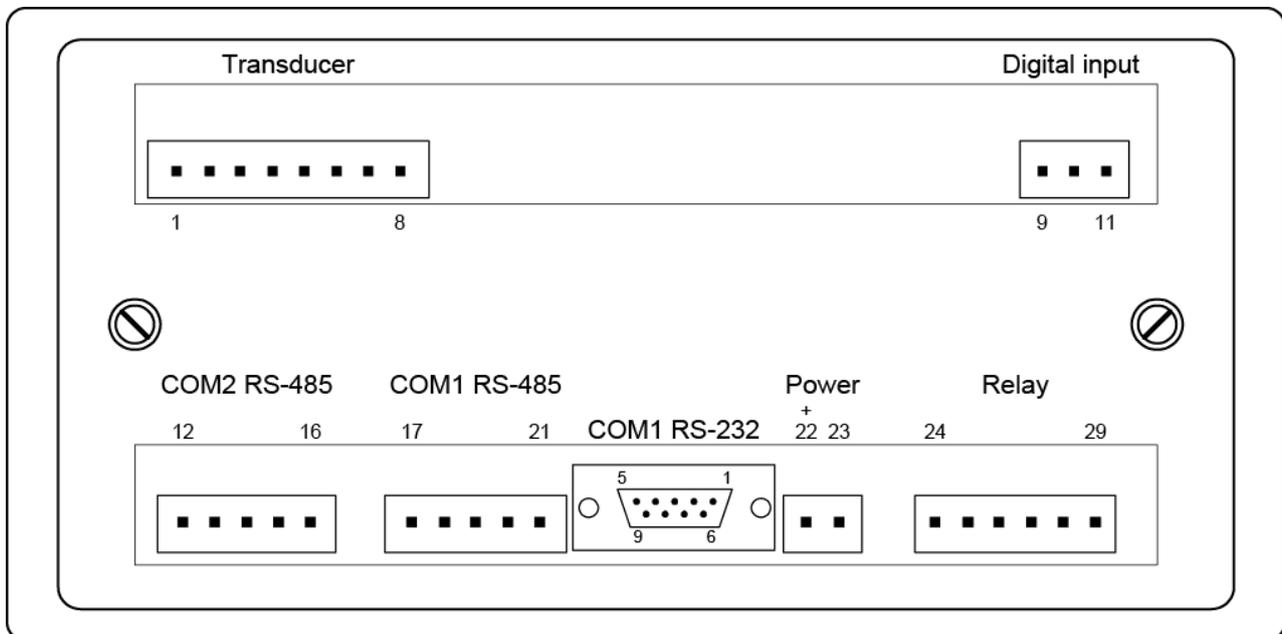
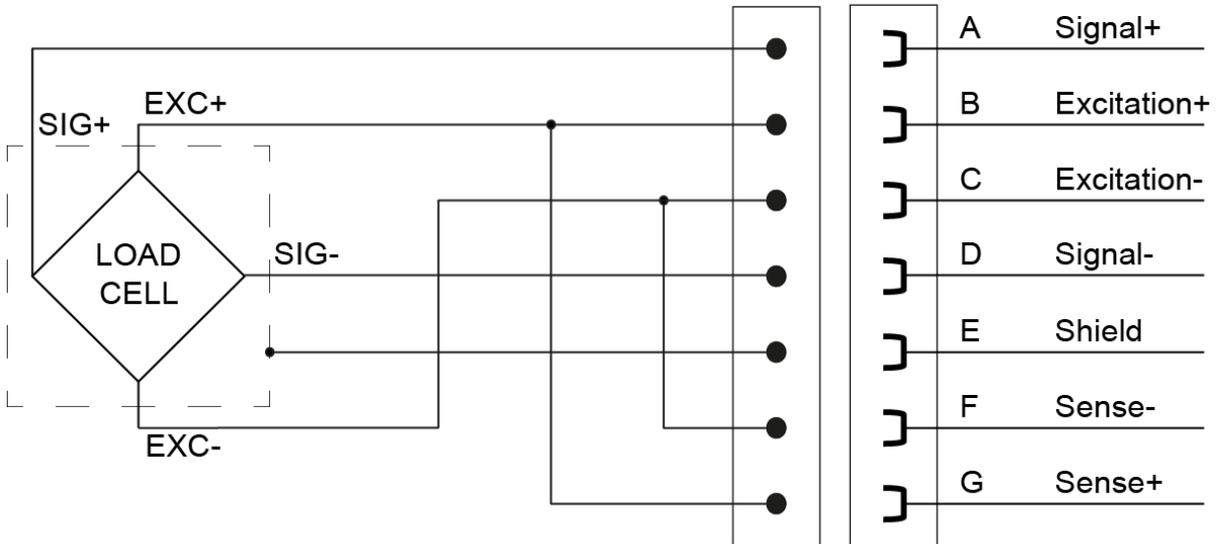


Figure 6 : Connectors at the rear of INDI-ISO376

CABLE MOUNTED PLUG
97-3106A-16S-1P



97-3102A-16S-1S
CHASSIS MOUNTED SOCKET

Figure 7 : Connection diagram for standard load cell connections (front)

Rear mounted socket

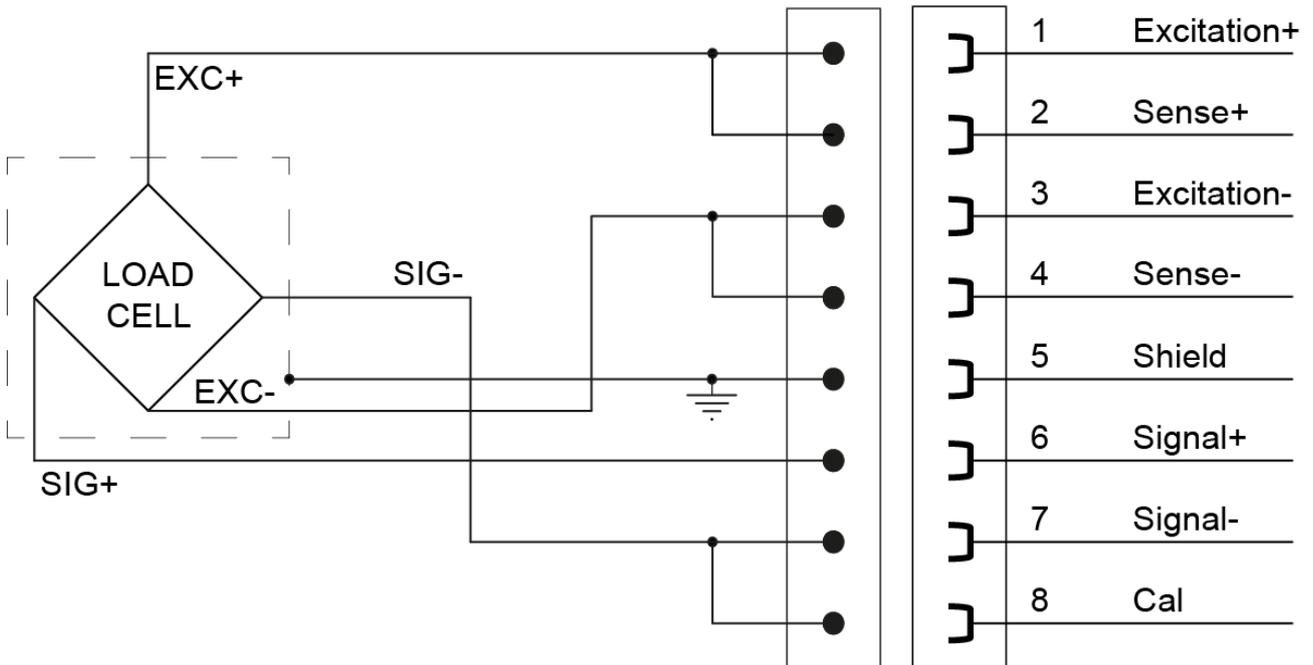


Figure 8 : A transducer may be connected directly to terminals at INDI-ISO376

For several transducers or long distance, a junction box and lengthening cable is needed.

2. INSTALLATION

2.1. Mechanical installation

Weight Indicator INDI-ISO376 is designed with a smooth housing, mainly for panel mounting. An integrated gasket at the instrument front gives a sealed attachment to mounting panels, up to 10 mm thick. See Figure 3 for mechanical dimensions.

2.2. Electrical installation

All electrical connections to the INDI-ISO376 unit, including possible connection to ground, are made via plug-in terminal blocks with polarization tabs and a D-sub connector. The installation must be carried out with shielded cables, routed to avoid electromagnetic interference from power cables.

The inputs and outputs for INDI-ISO376 are galvanically isolated from each other to facilitate connection of various external equipment.

2.2.1. Transducer input

Terminals 1 – 8

Transducer connection should be handled with great care to achieve good measuring data. Integrated transducer cables may not be shortened.



NOTE! Transducer cables must be routed at least 200 mm away from 230/380 V, 50/60 Hz power cables. By cables with other frequencies or high power, an even wider distance is preferable.

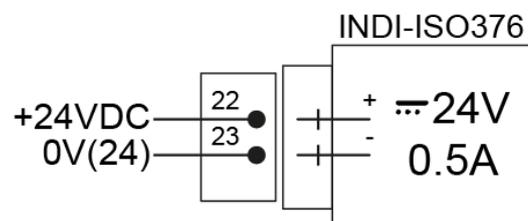
4-wire connection can be used if the integrated transducer cable is long enough to be connected directly at INDI-ISO376. By 4-wire connection, some terminals at INDI-ISO376 must be interconnected as shown in Figure 6. The cable shield and terminal 5 must be connected to earth in one point.

7-wire connection should be used if the integrated cable must be lengthened or if several transducers should be connected to one INDI-ISO376 unit. The cable shields and terminal 5 must be connected to earth in one point.

2.2.2. Power supply

Terminals 22, 23

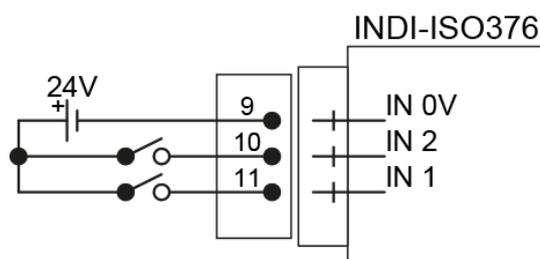
The weight indicator INDI-ISO376 should be powered by 20 – 28 V DC, see Technical data, connected according to the diagram. Sensy provides a range of mains operated power supplies, intended for various numbers of INDI-ISO376 units.



2.2.3. Digital inputs

Terminals 9 – 11

Two digital inputs are provided, with functions that can be set in the INDI-ISO376 set-up.



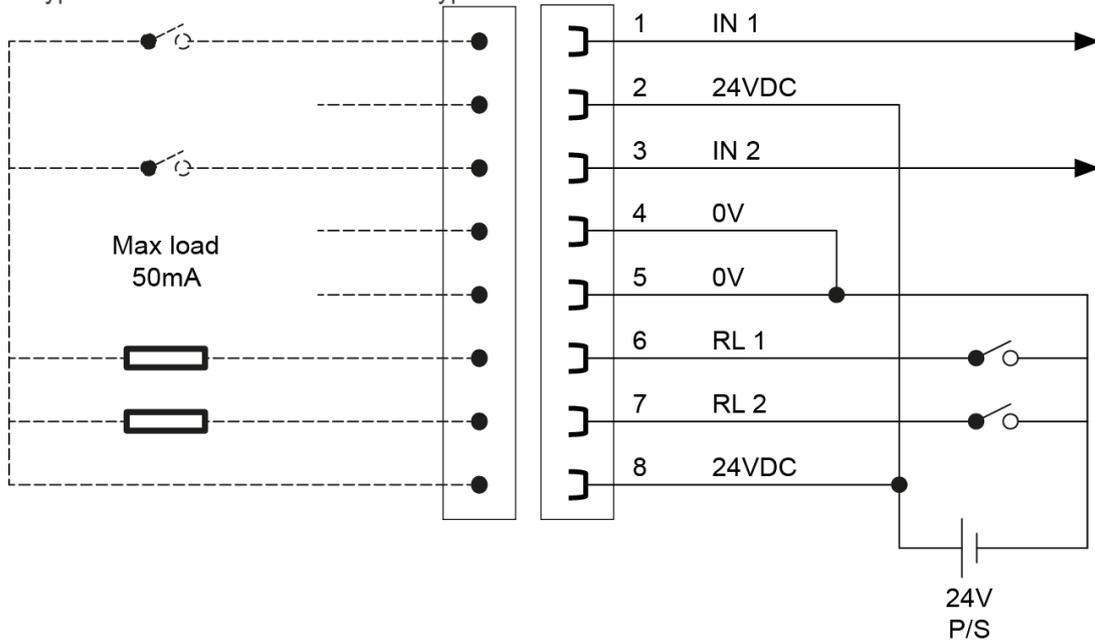
2.2.4. Digital inputs and outputs (Case and Chassis versions)

Front panel mounted connector

Two digital inputs are provided, with functions that can be set in the INDI-ISO376 set-up. These require only volts free contacts to operate.

Two digital (relay) outputs are provided with contact rating given in Technical data.

When the relays are used, the operator has to observe the requirements of interference emission for electrical and electronic devices (EN 50081) on the contact side and take appropriate measures, if necessary. Chassis Connector type R486-195. Cable Connector type R486-173.

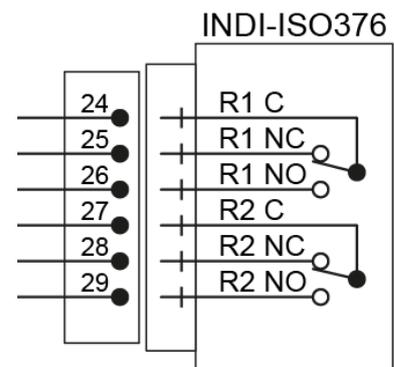


2.2.5. Relay outputs

Terminals 24 – 26 and 27 – 29

Two digital (relay) outputs are provided with contact rating given in Technical data.

When the relays are used, the operator has to observe the requirements of interference emission for electrical and electronic devices (EN 50081) on the contact side and take appropriate measures, if necessary.



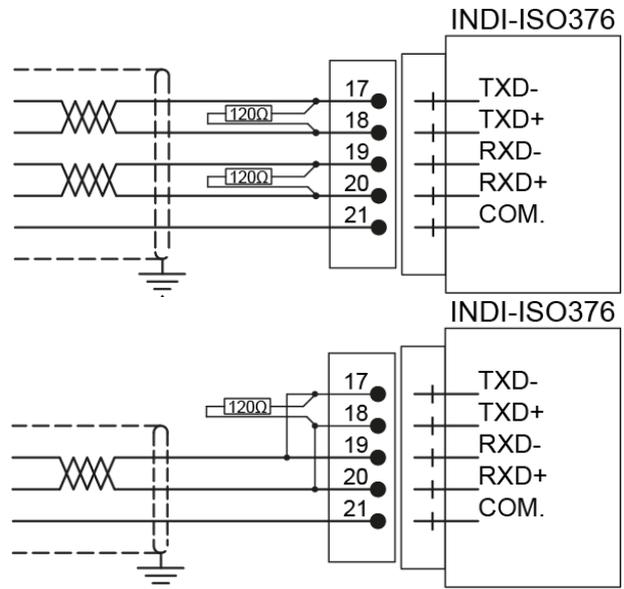
2.2.6. Serial communication COM1

RS485 com1 NOT taken out to front panel connectors as standard

Communication port COM1 can be used for serial communication with computer/PLC (Modbus), printer, or external display unit.

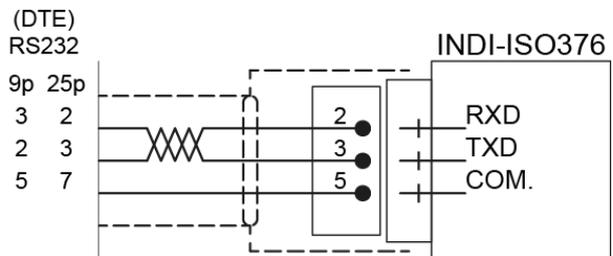
Connection alternatives:

Terminals 17 – 21
 Serial communication interface: RS-485/RS-422 for 2-wire or 4-wire with common earth (COM).
 The communication lines must have 120 ohm termination at both ends.



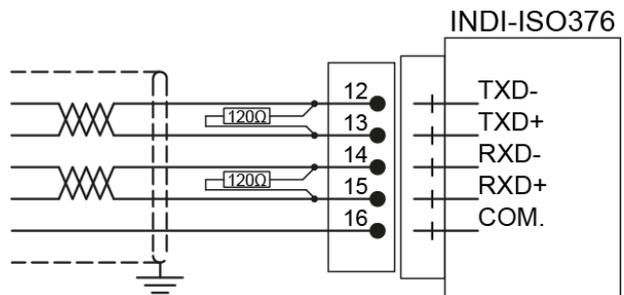
or

9-pole D-sub
 Serial communication interface: RS-232.
 Point to point, only one INDI-ISO376 unit connected to the computer/PLC, printer, or external display unit.



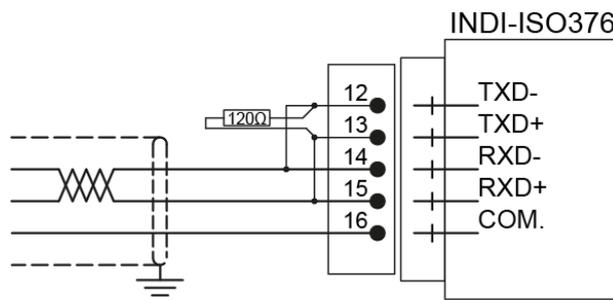
2.2.7. Serial communication COM2

Terminals 12 – 16
 Serial communication interface: RS-485/RS-422 for 2-wire or 4-wire with common earth (COM).
 The communication lines must have 120



ohm
termination at
both ends.

Communication port
COM2 should be used for
serial communication with:
computer/PLC (Modbus),
printer, external
display unit, or additional
I/O units.



Rear and front panel mounted 9 way 'D' plug on Laboratory cased version.

2.3. Front panel

The instrument has a flat, waterproof front panel with a backlit LCD display, function keys, symbol keys, and keys for entry of numbers and letters.

2.3.1. Display

At normal operation INDI-ISO376 displays a weight value digitally (the text Net is added for net weight) and, in most cases, the gross weight as a graphic bar. Presentation, together with the weight value, of date and time, preset tare, status for digital I/O's or status for the level supervision can also be selected.

If an error occurs, the weighing function is stopped and the instrument switches over to Error mode, indicating a code for the error at the display window.

INDI-ISO376 can be switched to information mode, displaying a Main menu with sub menus for display of actual data and entry of new data. In these sub menus a triangular blinking cursor, controlled by the function keys, is used to select menu and parameter.

2.3.2. Function keys

Just below the display there are four function keys, marked with arrows, and with the actual key functions indicated at the lower line of the display. When there is no text above a key, that key has no function.

An ENTER key in the lower right corner of the panel is used to open a selected menu, finish the entry of a value, etc. In many cases it has the same function as the function key to the right.

2.3.3. Symbol keys

To the right of the display there are four keys, marked with the weighing symbols for tarring, gross/net, printing and zeroing. A brief description of these keys is given in the table below. Refer to section 5. Operation for a more detailed description of the symbol key functions.

Key	Name	Function
<i>REL ZERO</i>	RELATIVE ZERO	Relative zeroing, i.e. The AUTO RELATIVE ZERO value is equal to the ABSOLUTE value and display switches to relative force. Depending on actual setting relative zeroing may be prevented if 'Motion' is displayed
<i>ABS REL</i>	ABSOLUTE/RELATIVE	Toggling between display of Absolute force and relative force. Relative force can be displayed only if a relative zero force has been entered
<i>PRINT</i>	PRINT	Printing of the displayed force value on a connected printer (according to parameter settings in INDI-ISO376). Or storing if STORED PRINT function enabled
<i>HOLD</i>	HOLD	Operates the HOLD function to freeze a reading on the display, if function enabled

2.3.4. Definition of digit keys

The digit keys, including keys with minus sign and decimal point, are used for entry and editing of numerical parameter values.

Digit keys 2 through 9 are also marked with letters and can, in some menus, be used for text entry. Then the digit and the letters of a key will be displayed in sequence as the key is activated several times.

The digit key 0 (zero) also has a special function, indicated by the letter i:

When INDI-ISO376 displays the weight value and the i key is pressed, the instrument switches over to display of the instrument Main menu. In sub menus to that menu parameter values and data can be shown, and in some cases edited.

When INDI-ISO376 displays the instrument Main menu, pressing the i key will open the menu 'Edit set-up'. Another way is to position the cursor at sub menu name 'Edit set-up' and press function key ENTER, or the ← key. As menu 'Edit set-up' is open all normal measuring functions are stopped and the parameter values can be edited.

The digit keys 1 through 4, - and . may have special functions, stop and start functions when optional programs are activated.

3. SET-UP

3.1. General

All operating functions in INDI-ISO376 are controlled by parameters. The parameter values are permanently stored in INDI-ISO376 and will not be lost when the module is switched off. At delivery the parameters are factory-set to default values, giving the weight indicator an initial standard function.

The actual setting of the parameter values can be read during normal measuring operation in sub menus to 'Show set-up'. The parameter values in these menus can also be printed out on a connected printer.

Editing cannot be performed in menu 'Show set-up'.

Editing of parameter values can be performed in sub menus to 'Edit set-up', using the display and keys on the front panel of INDI-ISO376, but this will interrupt the normal measuring operation. Editing can also be performed by serial communication. During such remote editing the panel keys are disabled and INDI-ISO376 displays the following message :

Remote set-up
Please wait!

In INDI-ISO376 two security locks are provided to protect from unauthorized editing of parameters and values. The locks are opened by four-digit codes.

3.2. Menu 'Show set-up'

Menu 'Show set-up' with sub menus contain all used set-up parameters, arranged according to figure 20 on next page. When menu 'Show set-up' is open, INDI-ISO376 is performing normal measuring operations while actual parameter settings can be shown or printed out. No parameter values can be edited from menu 'Show set-up'.

To open 'Show set-up', first press digit key *i* to open the instrument Main menu. Then press function key DOWN several times to position the cursor at 'Show set-up'.

Press function key ENTER, and menu 'Show set-up' will be opened. In this menu the cursor can be positioned, by UP and DOWN, at any sub menu name.

Press function key ENTER to show the parameters in the chosen sub menu.

3.2.1. Printing of Set-up parameter values

If a printer is connected and PRINT is pressed when menu 'Show set-up' is open, printing of a complete list of all parameter values can be started. The printout will take several minutes to conclude.

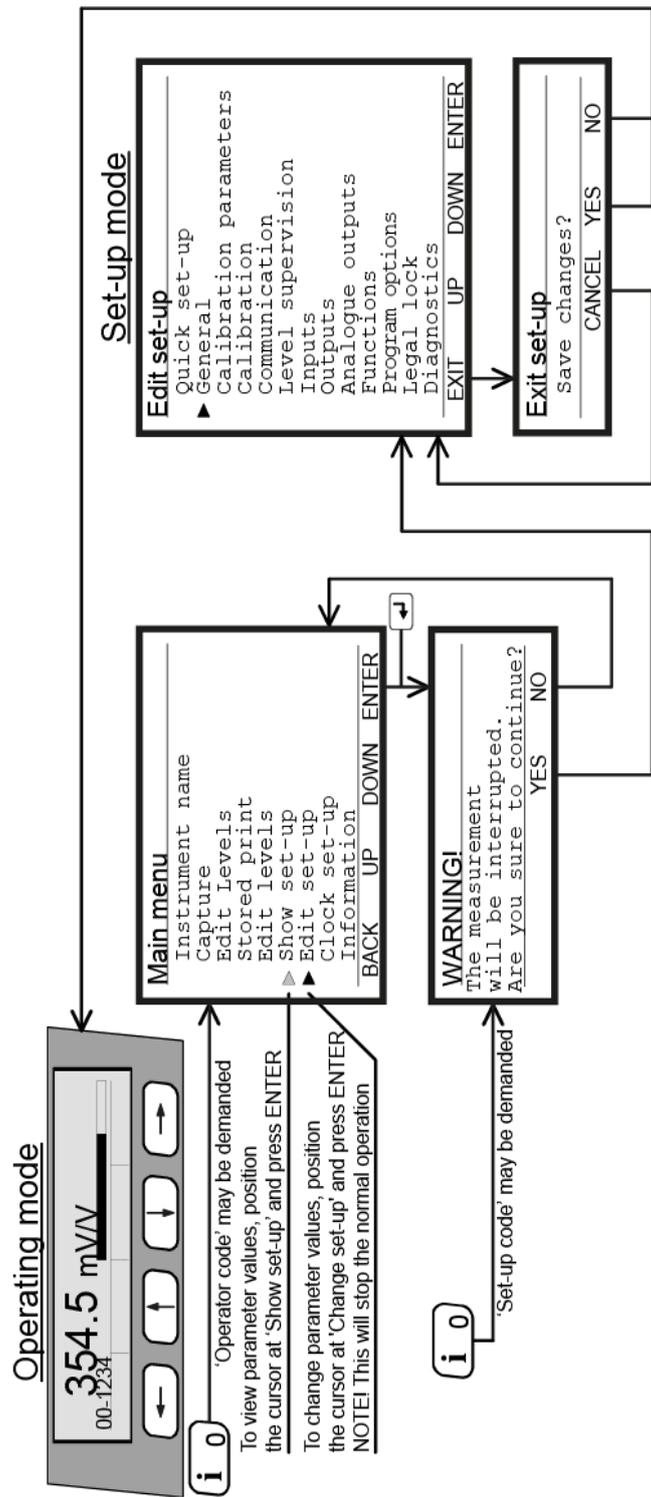
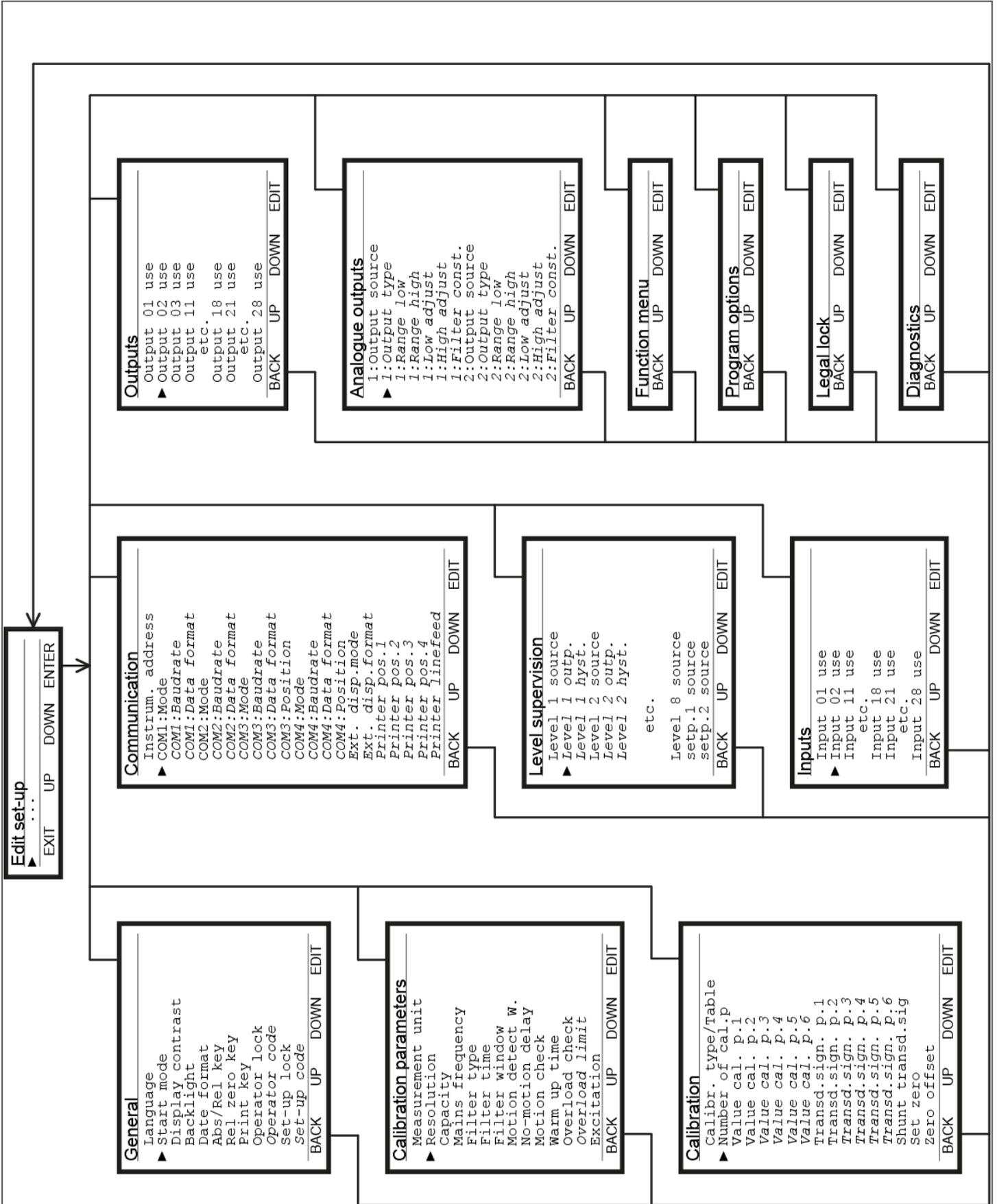


Figure 9 : The parameters are arranged in a number of menus. For some parameters, viewing is conditional. Parameter editing can only be performed when the normal measuring operation is interrupted. Consequently, the selection of 'Edit set-up' must be acknowledged, and a valid code for a security lock may be demanded.



3.3. Complete set-up

At delivery, the INDI-ISO376 parameters are set to default values. In a set-up operation these values can be edited to appropriate values for the actual installation. These values will be permanently saved in the instrument memory. Parameter editing can be performed at INDI-ISO376 in sub menus to 'Edit set-up' or by serial communication.

3.3.1. Enter menu 'Edit set-up'

Warning! Entering 'Edit set-up' will stop all measuring operations!

The digit key for 0 (zero), also marked *i*, should be used to open the menus.

When INDI-ISO376 is in normal operation, and the key *i* is pressed, a switch over to the instrument Main menu will be performed. If required, the Operator code must be entered for entry in the Main menu.

When INDI-ISO376 displays the Main menu, and the key *i* is pressed again, switch over to menu 'Edit set-up' will be performed. If required, the Set-up code must be entered for entry in 'Edit set-up'.

Before 'Edit set-up' is opened, and the measurement function is interrupted, a warning will be displayed. Press function key NO to stay in normal measuring operation. Press YES to continue, and INDI-ISO376 will switch to menu 'Edit set-up'.

3.3.2. Sub menus

The set-up parameters in INDI-ISO376 are presented in sub menus, see figure 20 and 21, which lists the parameters in the sub menu. In menu 'Edit set-up', a flashing cursor can be positioned at any sub menu name by the function keys UP/DOWN. The list of sub menu names will scroll as the cursor reaches the border of the list. Press function key ENTER, or the *↵* key, to open the sub menu at the cursor.

Set-up mode

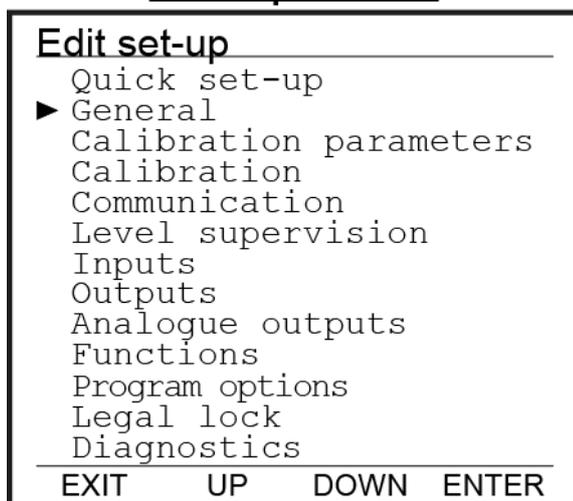


Figure 10 : Menu 'Edit set-up' presents the names of the sub menus and has a cursor that can be positioned at any name.

3.3.3. Parameters

When a sub menu is opened, the flashing cursor can be positioned at any parameter name by the function keys UP/DOWN. The list of parameters will scroll as the cursor reaches the border of the list.

3.3.4. Editing procedure

Parameter editing can only take place in menu 'Edit set-up'. Because all normal measuring functions will be interrupted, a warning will be given before menu 'Edit set-up' is opened. The codes for the 'Operator lock' and the 'Set-up lock' may also be demanded.

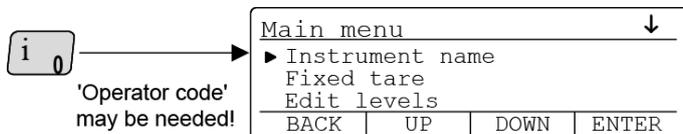
In menu 'Edit set-up' a sub menu can be selected by positioning of the cursor and pressing the key ENTER.

In the sub menu the cursor should be positioned at the parameter to edit.

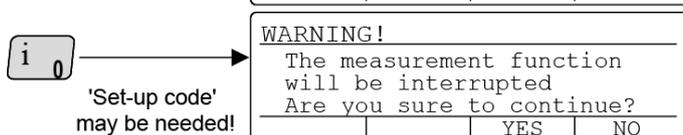
When the indicated parameter has been selected, by function key EDIT, the cursor moves to the parameter value and the function keys will get editing functions.

Selecting a parameter in 'Edit set-up':

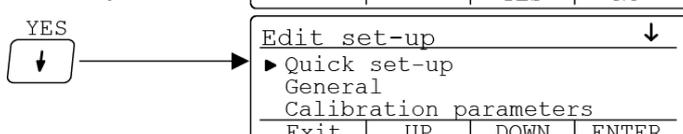
Press the key marked **i** (digit key 0). (The Operator code may be demanded.) The instrument Main menu will be shown.



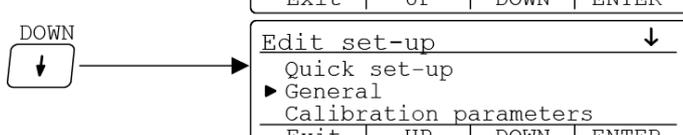
Press **i** (digit key 0) again to enter in menu 'Edit set-up'. (The Set-up code may be demanded.) A warning menu will be shown.



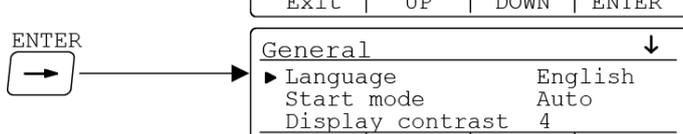
Press **YES** to enter in 'Edit set-up'. Normal measuring will be interrupted and editing will be possible.



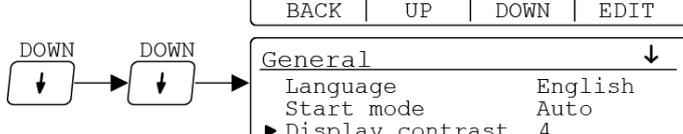
Position the cursor, by **UP/DOWN**, at a sub menu name.



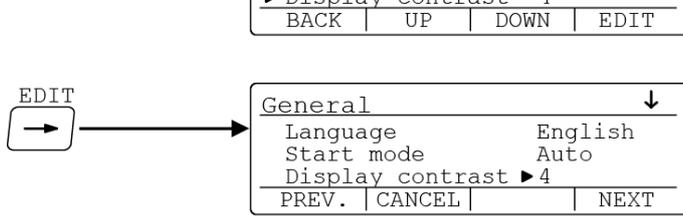
Press **ENTER** (or **↵**) to open the indicated sub menu. A list of the parameters in the sub menu will be shown.



Position the cursor, by **UP/DOWN**, at a parameter name.



Press **EDIT** (or **↵**) to start editing of the indicated parameter. The cursor moves from the parameter name to the parameter value. (If the parameter value is "numerical" an underscore line will replace the value.)



Editing of selected parameter values:

Parameter values in INDI-ISO376 can be of "choice" type: a pre-set value or function, selected from a list of alternatives. Or the values can be "numerical": a new parameter value should be entered by the digit keys.

- For "choice" parameters, function keys **PREV./NEXT** can be used to step through the list of value alternatives. The displayed alternative is entered and made active as key **↵** is pressed.
- For "numerical" parameters, a parameter value can be entered by the digit keys. The last digit can be removed by function key **<-**. The displayed numerical value is entered and made active as key **↵** is pressed.

When the editing of one parameter value is terminated by the **↵** key, the cursor will move to the parameter name. If another parameter in the same sub menu should be edited, function keys **UP/DOWN** can be used to position the cursor. See previous page.

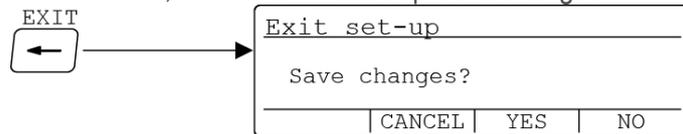
Press function key **BACK** to switch over to menu 'Edit set-up'. In that menu keys **UP/DOWN** can be used to position the cursor at another sub menu name. Pressing function key **ENTER** will open that menu. See previous page.

Leaving menu 'Edit set-up':

In sub menus to 'Edit set-up' function key BACK can always be pressed to switch INDI-ISO376 back to menu 'Edit set-up'.

To leave menu 'Edit set-up', function key EXIT should be pressed. If no parameters have been edited, INDI-ISO376 will switch over to normal operation, displaying the force value.

If any parameter value has been edited, the menu 'Exit set-up Save changes?' will be displayed.



Save: Press function key YES.

All edited parameter values will be saved permanently.

INDI-ISO376 will switch over to normal force display.

Don't save: Press function key NO.

The edited values will not be saved; the parameters resume the values that were valid before the editing started.

INDI-ISO376 will switch over to normal force display.

Don't exit: Press function key CANCEL.

Menu 'Edit set-up' will stay open and editing can be continued. The edited parameter values will stay active but the values are not permanently saved.

3.3.5. Sub menus to 'Edit set-up'

General

This menu contains parameters used to define the properties of the display window and the keys at the INDI-ISO376 panel.

Calibration parameters

This menu contains parameters defining the measuring properties for the scale installation with INDI-ISO376.

Calibration

This menu contains parameters for calibration of the scale.

Communication

This menu contains parameters for two internal and two external serial communication ports, and for the remote display and printer that can be connected.

Level supervision

This menu contains parameters for the level supervision and setpoint functions in the instrument.

Inputs

This menu contains parameters for the function of internal and external digital inputs to INDI-ISO376.

Outputs

This menu contains parameters for the function of internal and external digital outputs from INDI-ISO376.

Analogue outputs

This menu contains parameters for the function of optional analogue output units that can be connected to INDI-ISO376.

Function menu

This menu contains parameters for special programs.

Program options

This menu is used for activation of program options in INDI-ISO376.

Diagnostics

This menu can be used by troubleshooting to check input and output functions of INDI-ISO376 and external units.

3.4. Parameters

On the following pages a survey of all parameters is presented. The parameters are divided in groups following the menu they belong to. The first line indicates the parameter name and the Modbus address, used for set-up by serial communication. The parameters are saved in two different float value formats, and consequently also in two different memory registers.

For choice parameters an index in [] is given for each alternative. (These indices are used for set-up by serial communication.)

For numerical parameters, a value range is given.

At the end of the table, the default value is given in < >.

To the right there is a short parameter explanation and, *in italic*, the results for the different alternatives.

3.4.1. Menu 'General'

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
Language		
		Modbus: 41000 (46000)
[0]	Svenska	Defines the language to be used in menus and messages. T510a211 only supports the ENGLISH setting
[1]	English	
[2]	Deutsch	
[3]	Français	
[4]	Suomi	
[5]	Espanol	
[6]	Nederlands < English >	
Start mode		
		Modbus: 41002 (46002)
[0]	Command	Defines the start mode after power-on or reset.
[1]	Auto < Auto >	Command: A 'start operation' command from control computer or panel key is required for start up. Auto: Automatic start up.
Display contrast		
		Modbus: 41004 (46004)
[0]	0	Defines the text contrast for the display window. Low values giving paler characters but better readability at slanted display. High values giving sharper characters but reduced readability at slanted display.
[1]	1	
[2]	2	
[3]	3	
[4]	4	
[5]	5	
[6]	6	
[7]	7	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
< 4 >		
Backlight		
[0]	0	Modbus: 41006 (46006) Defines the backlight intensity for the display. 0 - 9: Low to high light intensity.
[1]	1	
[2]	2	
[3]	3	
[4]	4	
[5]	5	
[6]	6	
[7]	7	
[8]	8	
[9]	9	
< 5 >		
Date format		
[0]	YYYY-MM-DD	Modbus: 410108(46008) Defines the date format on printouts. YYYY: = year. MM: = month. DD: = day.
[1]	YYYY-DD-MM	
[2]	DD-MM-YYYY	
< YYYY-MM-DD >		
Absolute/relative key		
[0]	Off	Modbus: 41010 (46010) Disables/enables front panel key Absolute/relative.
[1]	On	
< On >		
Rel Zero key		
[0]	Off	Modbus: 41012 (46012) Disables/enables front panel key Relative Zero.
[1]	On	
< On >		
Print key		
[0]	Off	Modbus: 41014 (46014) Disables/enables front panel key Print.
[1]	On	
< On >		
Operator lock		
[0]	Off	Modbus: 41016 (46016) Off: Operator lock is not activated. On: Operator lock is activated, preventing unauthorised display and editing of settings in INDI-ISO376.
[1]	On	
< Off >		
Operator code		
	Range: 1 – 9999	Modbus: 41018 (46018) Defines the valid code for Operator lock. Only shown if Operator lock is 'On'. If 'Set-up lock' (see below) is 'On' this code will not give access to 'Edit set-up'.
	< 1937 >	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
Set-up lock		
[0]	Off	Modbus: 41020 (46020) Off: Set-up lock is not activated. On: Set-up lock is activated, preventing parameter editing in Edit set-up.
[1]	On	
	< Off >	
Set-up code		
	Range: 1 – 9999	Modbus: 41022 (46022) Defines the valid code for Set-up lock. Only shown if Set-up lock is 'On'. If 'Operator lock' (see above) is 'On' this code will still give access to all menus in the Main menu.
	< 1937 >	

3.4.2. Menu 'Calibration parameters'

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
Measurement unit		
[0]	mV/V	Modbus: 41024 (46024) INDI-ISO376 is set to only mV/V or μ V/V.
[1]	μ V/V	
	< mV/V >	
Resolution		
[0]	0.00001	Modbus: 41026 (46026) Defines the decimal point position and resolution format for the displayed value. All set-up parameters using the measurement unit will be written with the decimal point position selected in this menu. If the last digits of the force value are not stable, a more coarse resolution can be selected to get a stable reading.
[1]	0.00002	
[2]	0.00005	
[3]	0.0001	
[4]	0.0002	
[5]	0.0005	
[6]	0.001	
[7]	0.002	
[8]	0.005	
[9]	0.01	
[10]	0.02	
[11]	0.05	
[12]	0.1	
[13]	0.2	
[14]	0.5	
	< 0.00001 >	
Capacity		
	Range: 1 to 10	Modbus: 41028 (46028) Nominal range of scale. Capacity/Resolution = Number of divisions.
	Unit: Measurement unit	
	< 4 >	
Mains frequency		
[0]	50 Hz	Modbus: 41030 (46030) Defines a filter for suppression of mains frequency noise. 50 Hz: 50 Hz filter activated.
[1]	60 Hz	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
	< 50 Hz >	60 Hz: 60 Hz filter activated.
Filter type		Modbus: 41032 (46032)
[0]	Short	Used to filter transducer signal for optimum stability.
[1]	Standard	Short: Decreases weighing accuracy. (Fast response to a transducer signal change.)
[2]	Long	Standard: Normal setting.
[3]	Special	Long: Improves the suppression of unstable force on the transducers. (Delays response to a transducer signal change.)
	< Standard >	Special: Filter time set in parameter 'Filter Time'.
Filter time		Modbus: 41034 (46034)
	Range: 200 to 20000 for 50 Hz, 167 to 20000 for 60 Hz.	When 'Filter type' is set to Short, Standard or Long the filter time is automatically calculated by INDI-ISO376 and can be read here.
	Unit: ms	When 'Filter type' is set to 'Special' the filter time can be defined here, giving more flexibility. For more information, see Filter function in section 5 Operation.
	< 800 >	
Filter window		Modbus: 41036 (46036)
	Range: 0 to 10	INDI-ISO376 produces unfiltered and filtered force internally. If the difference between the two latest filtered weights is less than 'Filter window' the filtered force is used.
	Unit: Measurement unit	Otherwise the unfiltered force is used. This parameter value has one decimal more than parameter Resolution, to allow 'Filter window' to be smaller than the resolution.
	< 10 * Resolution >	
Motion detect w.		Modbus: 41038 (46038)
	Range: 0 to 10	Motion status is 'on' when the force value is not stable. It goes off when the force has been stable for the 'No motion delay time'. Motion condition exists if the change in force between two conversions is greater than the window 'Motion detect w.'
	Unit: Measurement unit	This parameter value has one decimal more than parameter Resolution, to allow 'Motion detect w.' to be smaller than the resolution.
	< 1 * Resolution >	
No-motion delay		Modbus: 41040 (46040)
	Range: 0 to 10.0	Delay in seconds from detection of stable force until the Motion status goes off.
	Unit: s	
	< 1.0 >	
Motion check		Modbus: 41042 (46042)
[0]	Off	Off: Only zero adjustment is inhibited during motion.
[1]	On	On: Inhibits zero adjustment, relative zeroing, and printing during motion.
	< Off >	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
Warm up time		
	Range: 0 – 200 Unit: min < 0 >	Modbus: 41044 (46044) Defines the delay time in minutes from power up until the force presentation has full accuracy. Indicated in the display with the text 'Warming up!'
Overload check		
[0]	Off	Check of overload is performed according to this set-up.
[1]	Uni-polar	Off: No check is performed. Force will be reported up to the limits of the AD converter.
[2]	Bipolar	Uni-polar: Overload status will be set if 'Overload limit' is exceeded. Under-load status will be set if the gross force is below minus (-)9*Resolution.
	< Off >	Bipolar: Overload status will be set if Overload limit is exceeded. Under-load status will be set if the gross force is below minus (-) Overload limit.
Overload limit		
	Range: 0.5 to 10 Unit: Measurement. Unit < Capacity + 9 * Resolution >	Modbus: 41048 (46048) Should be set to the max gross force that the force indicator is allowed to report. This parameter is always set to default value when changing Resolution or Capacity. If 'Bipolar' overload check is selected the force will be reported up to the Overload limit and down to the minus (-) Overload limit.
Excitation		
[0]	DC	Selection of excitation for the transducers connected to the INDI-ISO376.
[1]	AC	DC: Transducer excitation is taken from the internal DC power supply.
[2]	External	AC: NOT INCLUDED (Transducer excitation with alternating polarity is taken from the internal power supply. This gives compensation for thermal e.m.f. effects in transducer connections.)
	< DC >	External: Transducer excitation is assumed to be taken from an external power supply, so only sense and transducer signal should be connected to INDI-ISO376.

3.4.3. Menu 'Calibration'

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
Calibration type		
[0]	Table	Modbus: 41052 (46052) Defines the type of calibration to be performed. A new calibration is initiated as a 'Calibration type' is selected.
	< Table >	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
		To initiate calibration PRESS 'EDIT' then press Key \leftarrow Table: INDI-ISO376 standard calibration method.
Number of cal. p	Range: 2 to 6 < 6 >	Modbus: 41054 (46054) Number of calibration points.
Value cal. p.1	Range: +/-10 Unit: Measurement. unit < 0 >	Modbus: 41056 (46056) In this parameter, enter the recorded value for the load on the scale in the first calibration point.
Value cal. p.2	Range: +/-10 Unit: Measurement. unit < 1.00000 >	Modbus: 41058 (46058) In this parameter, enter the recorded value for the load on the scale in the second calibration point.
Value cal. p.3	Range: +/-10 Unit: Measurement. unit < 1.50000 >	Modbus: 41060 (46060) In this parameter, enter the recorded value for the load on the scale in the third calibration point.
Value cal. p.4	Range: +/-10 Unit: Measurement. unit < 2.00000 >	Modbus: 41062 (46062) In this parameter, enter the recorded value for the load on the scale in the fourth calibration point.
Value cal. p.5	Range: +/-10 Unit: Measurement. unit < 3.00000 >	Modbus: 41064 (46064) In this parameter, enter the recorded value for the load on the scale in the fifth calibration point.
Value cal. p.6	Range: +/-10 Unit: Measurement. unit < 3.30000 >	Modbus: 41066 (46066) In this parameter, enter the recorded value for the load on the scale in the sixth calibration point.
Transd.sign. p.1	Range: +/-10	Modbus: 41068 (46068) In this parameter, enter the recorded value of the transducer

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
	Unit: mV/V < 0.00000 >	signal in the first calibration point.
Transd.sign. p.2	Range: +/-10 Unit: mV/V < 1.00000 >	Modbus: 41070 (46070) In this parameter, enter the recorded value of the transducer signal in the second calibration point.
Transd.sign. p.3	Range: +/-10 Unit: mV/V < 1.50000 >	Modbus: 41072 (46072) In this parameter, enter the recorded value of the transducer signal in the third calibration point.
Transd.sign. p.4	Range: +/-10 Unit: mV/V < 2.00000 >	Modbus: 41074 (46074) In this parameter, enter the recorded value of the transducer signal in the fourth calibration point.
Transd.sign. p.5	Range: +/-10 Unit: mV/V < 3.00000 >	Modbus: 41076 (46076) In this parameter, enter the recorded value of the transducer signal in the fifth calibration point.
Transd.sign. p.6	Range: +/-10 Unit: mV/V < 3.300000 >	Modbus: 41078 (46078) In this parameter, enter the recorded value of the transducer signal in the sixth calibration point.

3.4.4. Menu 'Communication'

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
Instrum. address	Range: 1 to 247 < 1 >	Modbus: 41080 (46080) Defines the instrument address for the INDI-ISO376-unit.
COM1:Mode		Modbus: 41082 (46082)
[0]	Not in use	Defines use of serial port Com 1.
[1]	Modbus	Not in use: The port is not used.
[2]	Modbus auto	Modbus: The port is used for control unit communication.
[3]	Ext. display	Modbus auto: The control unit baud rate (from 9600) and bit configuration (8-none-1, 8-even-1 or 8-odd-1) is auto-detected and used by INDI-ISO376.
[4]	Printer	
[5]	Printer 850	
[6]	E-2 No Addr	Ext. display: The port is used for transmission of the measurement value to an external display unit.
[7]	E-2 Addr	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
	<Modbus auto>	Printer: The port is used for a printer with 7 bit character set. Printer 850: The port is used for a printer with 8 bit character set and 850 Multilingual translation. E-2 No Addr: Not used E-2 Addr: Not used
COM1:Baud rate		Modbus: 41084 (46084)
[0]	300	Defines the baud rate for the serial communication. The parameter must be set to the baud rate of the external equipment. This parameter is not shown if 'Not in use' or 'Modbus auto' is selected in 'COM1:Mode'.
[1]	600	
[2]	200	
[3]	2400	
[4]	4800	
[5]	9600	
[6]	19200	
[7]	38400	
[8]	57600	
[9]	115200	
	< 9600 >	
COM1:Data format		Modbus: 41086 (46086)
[0]	7-none-2	Defines the bit configuration for the serial communication. The parameter must be set to the same configuration as for the external equipment. This parameter is not shown if 'Not in use' or 'Modbus auto' is selected in 'COM1:Mode'
[1]	7-even-1	
[2]	7-even-2	
[3]	7-odd-1	
[4]	7-odd-2	
[5]	8-none-1	
[6]	8-none-2	
[7]	8-even-1	
[8]	8-odd-1	
	< 8-none-1 >	
COM2:Mode		Modbus: 41088 (46088)
[0]	Not in use	Defines the use for serial port Com 2.
[1]	Modbus	Not in use: The serial port is not used.
[2]	Modbus auto	Modbus: The serial port is used for communication with a control unit.
[3]	Ext. display	Modbus auto: The control unit baud rate (from 9600) and bit configuration (8-none-1, 8-even-1 or 8-odd-1) is auto-detected and used by INDI-ISO376.
[4]	Printer	Ext. display: The serial port is used for transmission of the measurement value to an external display unit.
[5]	Printer 850	Printer: The serial port is used for a printer with 7 bit character set.
[6]	I/O bus	Printer 850: The serial port is used for a printer with 8 bit character set and 850 Multilingual translation.
	< I/O bus >	I/O bus: The serial port is used for NEAB I/O bus.

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
COM2:Baud rate		
[0]	300	<p>Modbus: 41090 (46090) Defines the baud rate for the serial communication. The parameter must be set to the baud rate of the external equipment.</p> <p>If 'COM2:Mode' is set to 'I/O bus', we recommend baud rates from 115200 to 460800.</p> <p>This parameter is not shown if 'COM2:Mode' is set to 'Not in use' or 'Modbus auto'.</p>
[1]	600	
[2]	1200	
[3]	2400	
[4]	4800	
[5]	9600	
[6]	19200	
[7]	38400	
[8]	57600	
[9]	115200	
[10]	230400	
[11]	460800	
	< 115200 >	
COM2:Data format		
[0]	7-none-2	<p>Modbus: 41092 (46092) Defines the bit configuration for the serial communication. The parameter must be set to the same configuration as for the external equipment.</p> <p>This parameter is not shown if 'COM2:Mode' is set to 'Not in use', 'Modbus auto' or 'I/O bus'.</p>
[1]	7-even-1	
[2]	7-even-2	
[3]	7-odd-1	
[4]	7-odd-2	
[5]	8-none-1	
[6]	8-none-2	
[7]	8-even-1	
[8]	8-odd-1	
	< 8-none-1 >	
<p>Note: Parameters for 'COM3:' are shown only if 'COM2:Mode' is set to 'I/O bus'!</p>		
COM3:Mode		
[0]	Not in use	<p>Modbus: 41094 (46094) Defines the use of serial port Com 3.</p> <p>Not in use: The serial port is not used.</p> <p>Modbus: The serial port is used for communication with a control unit.</p> <p>Modbus auto: The control unit baud rate (from 9600) and bit configuration (8-none-1, 8-even-1 or 8-odd-1) is auto-detected</p>
[1]	Modbus	
[2]	Modbus auto	
[3]	Ext. display	
[4]	Printer	
[5]	Printer 850	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
	< Not in use >	and used by INDI-ISO376. Ext. display: The serial port is used for transmission of measurement values to an external display unit. Printer: The serial port is used for a printer with 7 bit character set. Printer 850: The serial port is used for a printer with 8 bit character set and 850 Multilingual translation.
COM3:Baud rate		
[0]	300	Modbus: 41096 (46096) Defines the baud rate for the serial communication. The parameter must be set to the baud rate of the external equipment. This parameter is not shown if 'Not in use' or 'Modbus auto' is selected in 'COM3:Mode'.
[1]	600	
[2]	1200	
[3]	2400	
[4]	4800	
[5]	9600	
[6]	19200	
[7]	38400	
[8]	57600	
[9]	115200	
	< 9600 >	
COM3>Data format		
[0]	7-none-2	Modbus: 41098 (46098) Defines the bit configuration for the serial communication. This parameter must be set to the same configuration as for the external equipment. This parameter is not shown if 'Not in use' or 'Modbus auto' is selected in 'COM3:Mode'.
[1]	7-even-1	
[2]	7-even-2	
[3]	7-odd-1	
[4]	7-odd-2	
[5]	8-none-1	
[6]	8-none-2	
[7]	8-even-1	
[8]	8-odd-1	
	< 8-none-1 >	
COM3:Position		
[0]	Analog.out.1	Modbus: 41100 (46100) Defines in which additional unit serial port Com 3 is placed. This parameter is not shown if 'Not in use' is selected in 'COM3:Mode'.
[1]	Analog.out.2	
[2]	Dig.I/O 1	
[3]	Dig.I/O 2	
	< Dig.I/O 1 >	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
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Note: Parameters for 'COM4:' are shown only if 'COM2:Mode' is set to 'I/O bus'!

COM4:Mode

- [0] Not in use
- [1] Modbus
- [2] Modbus auto
- [3] Ext. display
- [4] Printer
- [5] Printer 850
- < Not in use >

Modbus: 41102 (46102)

Defines the use of serial port Com 4.
 Not in use: The serial port is not used. Modbus: The serial port is used for communication with a control unit.
 Modbus auto: The control unit baud rate (from 9600) and bit configuration (8-none-1, 8-even-1 or 8-odd-1) is auto-detected and used by INDI-ISO376.
 Ext. display: The serial port is used for transmission of measurement values to an external display unit.
 Printer: The serial port is used for a printer with 7 bit character set.
 Printer 850: The serial port is used for a printer with 8 bit character set and 850 Multilingual translation.

COM4:Baud rate

- [0] 300
- [1] 600
- [2] 1200
- [3] 2400
- [4] 4800
- [5] 9600
- [6] 19200
- [7] 38400
- [8] 57600
- [9] 115200
- < 9600 >

Modbus: 41104 (46104)

Defines the baud rate for the serial communication. The parameter must be set to the baud rate of the external equipment.

 This parameter is not shown if 'Not in use' or 'Modbus auto' is selected in 'COM4:Mode'.

COM4>Data format

- [0] 7-none-2
- [1] 7-even-1

Modbus: 41106 (46106)

Defines the bit configuration for the serial communication. This parameter must be set to the same configuration as for the

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
[2]	7-even-2	external equipment. This parameter is not shown if 'Not in use' or 'Modbus auto' is selected in 'COM4:Mode'.
[3]	7-odd-1	
[4]	7-odd-2	
[5]	8-none-1	
[6]	8-none-2	
[7]	8-even-1	
[8]	8-odd-1	
	< 8-none-1 >	

COM4:Position

- [0] Analog.out.1
- [1] Analog.out.2
- [2] Dig.I/O 1
- [3] Dig.I/O 2
- < Dig.I/O 2 >

Modbus: 41108 (46108)

Defines in which additional unit serial port Com 4 is placed.

This parameter is not shown if 'Not in use' is selected in 'COM4:Mode'.

Ext. disp.mode

- [0] Absolute force
- [1] Relative force
- [2] Disp. force
- < Absolute force >

Modbus: 41110 (46110)

Defines the value to send to the external display unit, connected to INDI-ISO376.

Absolute force: The gross force value is always sent.

Relative force: The net force value is always sent.

Disp. force: The absolute or relative force value is.

The parameter is shown only if any serial port is set to 'Ext. display'. See section 6. Communication, for further information.

Ext. disp.format

- [0] 4
- [1] 5
- [2] 6
- [3] 7
- [4] 32
- < 6 >

Modbus: 41112 (46112)

Defines the number of digits on the external display unit, connected to INDI-ISO376. Only shown if any serial port is set to 'Ext. display' See section 6. Communication, for further information.

Printer pos.1

- [0] Not in use
- [1] Disp. force
- [2] Date/Time
- [3] Instr.name
- [4] Hold

Modbus: 41114 (46114)

Defines the type of information to print in position 1 at the printer.

Not in use: Position 1 not used. (If both 'Printer pos.1' and 'Printer pos.2' are set to 'Not in use' the printer line is removed.)

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
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< Disp force >	Disp. force: Displayed force including the text Absolute/relative and unit. Date/Time: Date and time for the printout. Instr.name: Name of the instrument. Hold : hold value.
----------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

The parameter is shown only if 'Mode' for any serial port is set to 'Printer' or 'Printer 850'.

Printer pos.2

[0]	Not in use
[1]	Disp. force
[2]	Date/Time
[3]	Instr.name
[4]	Hold
	< Disp force >

Modbus: 41116 (46116)

Defines the type of information to print in position 2 at the printer.

Not in use: Position 2 not used. (If both 'Printer pos.1' and 'Printer pos.2' are set to 'Not in use' the printer line is removed.)

< Disp force >	Disp. weight: Displayed force including the text Absolute/relative and unit. Date/Time: Date and time for the printout. Instr.name: Name of the instrument. Hold : hold value.
----------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

The parameter is shown only if 'Mode' for any serial port is set to 'Printer' or 'Printer 850'.

Printer pos.3

[0]	Not in use
[1]	Disp. force
[2]	Date/Time
[3]	Instr.name
[4]	Hold
	< Disp force >

Modbus: 41118 (46118)

Defines the type of information to print in position 3 at the printer.

Not in use: Position 3 not used. (If both 'Printer pos.3' and 'Printer pos.4' are set to 'Not in use' the printer line is removed.)

< Disp force >	Disp. weight: Displayed force including the text Absolute/relative and unit. Date/Time: Date and time for the printout. Instr.name: Name of the instrument. Hold : hold value
----------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

The parameter is shown only if 'Mode' for any serial port is set to 'Printer' or 'Printer 850'.

Printer pos.4

Modbus: 41120 (46120)

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
[0]	Not in use	Defines the type of information to print in position 4 at the printer.
[1]	Disp. force	
[2]	Date/Time	
[3]	Instr.name	
[4]	Hold	
	< Disp force >	Disp. weight: Displayed force including the text Absolute/relative and unit. Date/Time: Date and time for the printout. Instr.name: Name of the instrument. Hold : hold value

The parameter is shown only if 'Mode' for any serial port is set to 'Printer' or 'Printer 850'.

Printer linefeed

[0]	0
[1]	1
[2]	2
[3]	3
[4]	4
[5]	5
[6]	6
[7]	7
[8]	8
[9]	9
[10]	10
	< 0 >

Modbus: 41122 (46122)

Defines the number of linefeeds after each printout. Each linefeed consist of CR LF.

The parameter is shown only if 'Mode' for any serial port is set to 'Printer'.

3.4.5. Menu 'Level supervision'

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
	Level 1 source	Modbus: 41124 (46124)
	Level 2 source	Modbus: 41130 (46130)
	Level 3 source	Modbus: 41136 (46136)
	Level 4 source	Modbus: 41142 (46142)
	Level 5 source	Modbus: 41148 (46148)
	Level 6 source	Modbus: 41154 (46154)
	Level 7 source	Modbus: 41160 (46160)
	Level 8 source	Modbus: 41166 (46166)
[0]	Not in use	Defines the signal to be supervised by the Level.
[1]	Relative force	Relative force: The Level operates on the relative force.
[2]	Absolute force	Absolute force: The Level operates on the absolute force
[3]	Disp. force	Disp. force: The Level operates on absolute force or Relative force
[4]	Abs. relative f.	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
[5]	Abs. absolute f.	Abs.: Stands for Absolute,(not to be confused with the absolute mode) the Level operates on the absolute value of force irrespective of sign (+ or -).
[6]	Abs. disp.f.	
[7]	not used	Offset lev.1: Not available for 'Level 1 source'. Example: If this alternative is selected for 'Level 2 source', Level 2 will operate on the same signal as Level 1, but for a different level. The level difference is set by Level 2
[8]	Offset lev.1	
Level 1 outp.		Modbus: 41126 (46126)
Level 2 outp.		Modbus: 41132 (46132)
Level 3 outp.		Modbus: 41138 (46138)
Level 4 outp.		Modbus: 41144 (46144)
Level 5 outp.		Modbus: 41150 (46150)
Level 6 outp.		Modbus: 41156 (46156)
Level 7 outp.		Modbus: 41162 (46162)
Level 8 outp.		Modbus: 41168 (46168)
[0]	Active above	This parameter defines the conditions for control of a possible used output. Active above: The used output is activated as the supervised signal level is above the set Level. Active below: The used output is activated as the supervised signal level is below the set Level. Note: This parameter is not shown if corresponding 'Level (X) source' is set to 'Not in use'. Relay outputs can be defined for the Levels, see menu 'Outputs'.
[1]	Active below <Active above>	
Level 1 hyst.		Modbus: 41128 (46128)
Level 2 hyst.		Modbus: 41134 (46134)
Level 3 hyst.		Modbus: 41140 (46140)
Level 4 hyst.		Modbus: 41146 (46146)
Level 5 hyst.		Modbus: 41152 (46152)
Level 6 hyst.		Modbus: 41158 (46158)
Level 7 hyst.		Modbus: 41164 (46164)
Level 8 hyst.		Modbus: 41170 (46170)
Range: +/-10 Unit: Measurement. unit < 0.2 >		Defines the hysteresis range for the Level. Positive value gives a hysteresis range above the switch level, negative value gives a range below the switch level. Note: This parameter is not shown if corresponding 'Level (X) Source' is set to 'Not in use'.
Setp.1 source		Modbus: 41172 (46172)
Setp.2 source		Modbus: 41174 (46174)
[0]	Not in use	Defines the signal to be supervised by the setpoint.
[1]	Relative force	Relative force: The Setpoint operates on the Relative force.

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
[2]	Absolute force	Absolute force: The Setpoint operates on the Absolute force
[3]	Disp. force	Disp. force: The Setpoint operates on Absolute force or
[4]	Abs. Relative F.	Relative force, even if the flow rate is displayed at INDI-ISO376.
[5]	Abs. Absolute F.	Abs.: Stands for Absolute,(not to be confused with the absolute mode) the Level operates on the absolute value of
[6]	Abs. disp.F. < Not in use >	force irrespective of sign (+ or -).

3.4.6. Menu 'Inputs'

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
Input 01 use		Modbus: 41176 (46176)
Input 02 use		Modbus: 41178 (46178)
Input 11 use		Modbus: 41180 (46180)
Input 12 use		Modbus: 41182 (46182)
Input 13 use		Modbus: 41184 (46184)
Input 14 use		Modbus: 41186 (46186)
Input 15 use		Modbus: 41188 (46188)
Input 16 use		Modbus: 41190 (46190)
Input 17 use		Modbus: 41192 (46192)
Input 18 use		Modbus: 41194 (46194)
Input 21 use		Modbus: 41196 (46196)
Input 22 use		Modbus: 41198 (46198)
Input 23 use		Modbus: 41200 (46200)
Input 24 use		Modbus: 41202 (46202)
Input 25 use		Modbus: 41204 (46204)
Input 26 use		Modbus: 41206 (46206)
Input 27 use		Modbus: 41208 (46208)
Input 28 use		Modbus: 41210 (46210)
[0]	Not in use	Defines the use of digital inputs to INDI-ISO376. Two digital
[1]	Relative zero	inputs, Input 01 and Input 02, are included in the INDI-ISO376
[2]	Absolute/relative	unit. The remaining inputs demand external I/O units, with 8
[3]	Absolute	inputs and 8 outputs each, to be connected to INDI-ISO376.
[4]	Relative	Relative zero: Input used for relative zeroing command.
[5]	Print	Absolute/relative: Input used for absolute/relative toggling.
[6]	HOLD	Absolute: Input used to switch INDI-ISO376 to Abs mode.
[7]	CAPTURE	Relative: Input used to switch INDI-ISO376 to Rel mode.
	< Not in use >	Print: Input used for print command.
		Hold HOLD input see HOLD function
		Capture CAPTURE input see CAPTURE function

3.4.7. Menu 'Outputs'

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
Output 01 use		Modbus: 41212 (46212)

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
	Output 02 use	Modbus: 41214 (46214)
	Output 11 use	Modbus: 41216 (46216)
	Output 12 use	Modbus: 41218 (46218)
	Output 13 use	Modbus: 41220 (46220)
	Output 14 use	Modbus: 41222 (46222)
	Output 15 use	Modbus: 41224 (46224)
	Output 16 use	Modbus: 41226 (46226)
	Output 17 use	Modbus: 41228 (46228)
	Output 18 use	Modbus: 41230 (46230)
	Output 21 use	Modbus: 41232 (46232)
	Output 22 use	Modbus: 41234 (46234)
	Output 23 use	Modbus: 41236 (46236)
	Output 24 use	Modbus: 41238 (46238)
	Output 25 use	Modbus: 41240 (46240)
	Output 26 use	Modbus: 41242 (46242)
	Output 27 use	Modbus: 41244 (46244)
	Output 28 use	Modbus: 41246 (46246)
[0]	Not in use	<p>Defines the use for the digital outputs. Two relay outputs, Output 01 and Output 02, are included in the INDI-ISO376 unit. The remaining outputs demand external I/O units, with 8 inputs and 8 outputs each, to be connected to INDI-ISO376.</p> <p>In process: Active output means active 'In process'.</p> <p>Level 1 - 8: Output activated by the Level.</p> <p>Setpoint 1, 2: Output activated by the Setpoint.</p> <p>Relative mode: Output active in relative mode.</p> <p>Good zero: Output active by 'good zero'.</p> <p>Stable Force: Output active by stable force.</p> <p>Print: Output to mimic print indication.</p>
[1]	In process	
[2]	Level 1	
[3]	Level 2	
[4]	Level 3	
[5]	Level 4	
[6]	Level 5	
[7]	Level 6	
[8]	Level 7	
[9]	Level 8	
[10]	Setpoint 1	
[11]	Setpoint 2	
[12]	Rel mode	
[13]	Good zero	
[14]	Stable force	
[15]	Print	
	< Not in use >	

3.4.8. Menu 'Analogue outputs'

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
	1:Output source	Modbus: 41248 (46248)
[0]	Not in use	<p>Defines the value to represent on Analogue output 1. Not in use: The analogue output is not used. Absolute force: The output represents Absolute force. Relative Force: The output represents Relative force. Disp. force: The output represents Absolute or Relative force.</p>
[1]	Absolute force	
[2]	Relative force	
[3]	Disp. force	
	< Not in use >	

1:Output type

Modbus: 41250 (46250)

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
[0]	+/-20mA	Defines the type of signal, used to represent the force value at Analogue output 1. +/-20mA, -12 - 20mA: bipolar current output. 0-20mA, 4-20mA: mono-polar current output. +/-10V: bipolar voltage output. 0-10V: mono-polar voltage output.
[1]	-12 - 20mA	
[2]	0-20mA	
[3]	4-20mA	
[4]	+/-10V	
[5]	0-10V	This parameter is not shown if '1: Output source' is set to 'Not in use'.
	< 4-20mA >	
1:Range low	Range: +/-10 Unit: Measurement. unit < 0 >	Modbus: 41252 (46252) Defines the Force value that should give the lowest output (0 V / 0 mA / 4 mA) at Analogue output 1. This parameter is not shown if '1: Output source' is set to 'Not in use'.
1:Range high	Range: +/-10 Unit: Measurement. unit < 4.0000 >	Modbus: 41254 (46254) Defines the Force value that should give the highest output (10 V / 20 mA) at Analogue output 1. This parameter is not shown if '1: Output source' is set to 'Not in use'.
1:Low adjust	Range: +/-999 < 0 >	Modbus: 41256 (46256) As this parameter is edited, Analogue output 1 will be activated with the lowest output signal (0 V / 0 mA / 4 mA). This parameter adds an offset to the output range and can be adjusted to give expected reading at lowest output for an instrument connected to Analogue output 1. Full adjustment range corresponds to about ±2 % of maximum analogue output. The parameter value will be set to zero each time '1: Output type' is changed. This parameter is not shown if '1: Output source' is set to 'Not in use'.
1:High adjust	Range: +/-999	Modbus: 41258 (46258) As this parameter is edited, Analogue output 1 will be

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
	< 0 >	<p>activated with the highest output signal (10 V / 20 mA). This parameter controls the output gain and can be adjusted to give expected reading at highest output for an instrument connected to Analogue output 1. Full adjustment range corresponds to about $\pm 2\%$ of maximum analogue output. The parameter value will be set to zero each time '1: Output type' is changed.</p> <p>This parameter is not shown if '1: Output source' is set to 'Not in use'.</p>
1:Filter const.		Modbus: 41260 (46260)
[0]	1	<p>This parameter is used to get a slower update rate on Analogue output 1, which gives more stable readings. Example: 'Filter time' 200 ms, and this parameter set to 5 gives 1 second update on Analogue output 1.</p> <p>This parameter is not shown if '1: Output source' is set to 'Not in use'.</p>
[1]	2	
[2]	3	
[3]	4	
[4]	5	
[5]	6	
[6]	7	
[7]	8	
[8]	9	
[9]	10	
	< 1 >	
2:Output source		Modbus: 41262 (46262)
[0]	Not in use	<p>Defines the value to represent on Analogue output 2. Not in use: The analogue output is not used. Absolute Force: The output represents absolute force. Relative Force: The output represents Relative force</p>
[1]	Absolute force	
[2]	Relative force	
	< Not in use >	
		[index] Range/Alternatives Explanation and <default value> result of alternatives.
2:Output type		Modbus: 41264 (46264)
[0]	+/-20mA	<p>Defines the type of signal, used to represent the force value at Analogue output 2. +/-20mA, -12 - 20mA: bipolar current output. 0-20mA, 4-20mA: mono-polar current output. +/-10V: bipolar voltage output. 0-10V: mono-polar voltage output.</p> <p>This parameter is not shown if '2:Output source' is set to 'Not in use'.</p>
[1]	-12 - 20mA	
[2]	0-20mA	
[3]	4-20mA	
[4]	+/-10V	
[5]	0-10V	
	< 4-20mA >	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
2:Range low	Range: +/-10 Unit: Measurement. unit < 0 >	Modbus: 41266 (46266) Defines the force value that should give the lowest output (0 V / 0 mA / 4 mA) at Analogue output 2. This parameter is not shown if '2: Output source' is set to 'Not in use'.
2:Range high	Range: +/-10 Unit: Measurement. unit < 4.00000 >	Modbus: 41268 (46268) Defines the force value that should give the highest output (10 V / 20 mA) at Analogue output 2. This parameter is not shown if '2: Output source' is set to 'Not in use'.
2:Low adjust	Range: +/-999 < 0 >	Modbus: 41270 (46270) As this parameter is edited, Analogue output 2 will be activated with the lowest output signal (0 V / 0 mA / 4 mA). This parameter adds an offset to the output range and can be adjusted to give expected reading at lowest output for an instrument connected to Analogue output 2. Full adjustment range corresponds to about ± 2 % of maximum analogue output. The parameter value will be set to zero each time '2: Output type' is changed. This parameter is not shown if '2: Output source' is set to 'Not in use'.
2:High adjust	Range: +/-999	Modbus: 41272 (46272) As this parameter is edited, Analogue output 2 will be

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
	< 0 >	<p>activated with the highest output signal (10 V / 20 mA). This parameter controls the output gain and can be adjusted to give expected reading at highest output for an instrument connected to Analogue output 2. Full adjustment range corresponds to about ± 2 % of maximum analogue output. The parameter value will be set to zero each time '2:Output type' is changed.</p> <p>This parameter is not shown if '2: Output source' is set to 'Not in use'</p>
2:Filter const.		Modbus: 41274 (46274)
[0]	1	<p>This parameter is used to get a slower update rate on Analogue output 2, which gives more stable readings. Example: 'Filter time' 200 ms, and this parameter set to 5 gives 1 second update on Analogue output 2.</p> <p>This parameter is not shown if '2: Output source' is set to 'Not in use'.</p>
[1]	2	
[2]	3	
[3]	4	
[4]	5	
[5]	6	
[6]	7	
[7]	8	
[8]	9	
[9]	10	
	< 1 >	

3.4.9. Menu 'Functions' (FTS set-ups)

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
1: Stored Print		
[0]	Off	Modbus: 41276 (45276) When set to ON the PRINT output is re-directed from the printer to registers that store up to 10 values for printing later. When printing is required, the set-up is changed to Off and printing of the stored values is achieved via the STORED PRINT menu.
[1]	On	
	< Off >	
2: Peak Function		
[0]	Off	Modbus: 41278 (45278) When set to ON the Peak positive and Peak negative values are shown on screen 2 & 3 of the information field on the main display.
[1]	On	
	< Off >	
3: Hold Function		
[0]	Off	Modbus: 41280 (45280) Enables the HOLD function.
[1]	On	
	< Off >	
4: Hold Auto		
[0]	Off	Print Modbus: 41282 (45282) Enables the automatic printing of the HOLD force value on triggering the HOLD state.
[1]	On	
	< Off >	
5: Log Function		
[0]	Off	Modbus: 41284 (45284) Enables the automatic printing of the displayed force value every time period.
[1]	On	
	< Off >	
6: Log Interval		
	Range: 1 –99	Modbus: 41286 (45286) Time period for LOG function. Only visible if LOG FUNCTION is set to ON
	Unit: minutes	
	< 10 >	
7: Capture Function		
[0]	Off	Modbus: 41288 (45288) Enables the CAPTURE function.
[1]	On	
	< Off >	
8: No of Readings		
	Range: 10 –100	Modbus: 41290 (45290) Number of readings captured after trigger. Only visible if CAPTURE FUNCTION is set to ON
	< 10 >	

[index]	Range/Alternatives <default value>	Explanation and result of alternatives. Menu 'General'
9: Trigger Type		Modbus: 41292 (45292)
[0]	Cap Lev	Defines the trigger type for the CAPTURE function.
[1]	DIO	LAL Triggered when force value greater than the 'Min Force for Printing value' in calibration parameters menu.
[2]	Lev1	DIO Triggered when DIO input as defined by the INPUTS menu is active.
[3]	Lev2	DIO Triggered when force value greater than the 'Level 1 value' if level enabled in LEVELS menu.
[4]	DIO+Lev1	Lev2 Triggered when force value greater than the 'Level 2 value' if level enabled in LEVELS menu.
[5]	NONE	DIO+Lev1 Triggered when DIO input as defined by the INPUTS menu is active AND force value greater than the 'Level 1 value'.
	<NONE>	
		Only visible if CAPTURE FUNCTION is set to ON
Capture Level		Modbus: 41294 (46294)
	Range: 0 to 999999	Level when CAPTURE function starts it recording. 0 gives no restrictions.
	Unit: Measurement unit	Only visible if CAPTURE TRIGGER TYPE = Cap Lev
	< 0 >	

3.5. Program options

In this sub menu, the name of each available program option is shown on one line. To activate a program option, a valid code must be entered on the option line. Individual codes, depending on the serial number of the instrument, can ordered from SENSY SA.

- Position the cursor at the program option you want to activate.
- Press function key EDIT, and the cursor moves to the right.
- Use the digit keys to enter the valid code for the option.
- Finish the code entry by pressing key ↵.

When a program option has been activated it can be deactivated by entry of 0 (zero), replacing the valid code for the option.

3.5.1. Temporary program option code

For temporary activation of program options a demo code is available. This code can be used once, for service (to activate an option in a replacement instrument) or to try out a program option for a limited time. The temporary demo code is 1 9 3 7 and it can be entered for any of the available program options to make it active for 7 days. After this time the activated program option will be automatically deactivated. To activate the program option after this "demo time" a valid code for the actual instrument must be ordered.

When a program option is running in "demo mode" this is indicated by the text *DEMO* in the instrument display. An activated program option in "demo mode" can be turned off by using "0" as program option code. NOTE! Don't forget to order a valid code immediately if you intend to use a program option for more than 7 days.

3.6. Security lock

In this sub menu the status of the security lock function is displayed. As the lock is On, editing of certain parameters is disabled. These parameters are:

- All parameters in menu Calibration parameters.
- All parameters in menu Calibration, except 'Set zero' and 'Zero offset'. For these parameters however the range is limited to $\pm 10\%$ of the scale Capacity from calibrated zero value.
- Parameter 'Display info' in menu General.
- Parameters 'Printer pos.1' to 'Printer pos.4' in menu Communication.

Editing of the program option selection is also disabled.

Setting of the security lock (On or Off) can be edited only after entry of a certain code.

4. CALIBRATION

When measuring with INDI-ISO376, the transducer output signal, corresponding to the transducer load, is converted to a force value. The conversion is controlled by several parameters with values defined during calibration of the instrument.

Some calibration types for INDI-ISO376 can be performed without any transducers connected, but the automatic filter time calculation will be correct only if all transducers of the force equipment are connected to the instrument.

Only one calibration type is supported by INDI-ISO376:

- Table calibration – Standard calibration method for INDI-ISO376.

Calibration can only be performed in menu 'Edit set-up'. (A 'Set-up code' may be demanded, and normal force functions must be interrupted.) Calibration starts as one calibration type is selected.

INDI-ISO376 units are calibrated using the TABLE method either at the NATIONAL PHYSICAL LABORATORY or at a recognised NAAMAS calibration centre. A known mV/V source is connected to the INDI-ISO376 and is compared with the indicated reading. Any variation to this standard is adjusted by entering a correction value in the table.

All calibration parameters are found in the menus under 'Calibration parameters' and 'Calibration'. The parameters are described in section 3. Set-up.

4.1. Common parameters

Measurement unit and resolution for the force value, and the capacity for the scale must be first specified. These parameters, among others, are found in menu 'Calibration parameters'. This section deals only with the calibration parameters.

Measurement unit

This parameter defines the engineering unit used for the force value. The same engineering unit will also be used for example in the parameter values 'Resolution', 'Capacity', 'Level', and 'Setpoint'. The INDI-ISO376 utilises as standard only mV/V and $\mu\text{V/V}$.

Resolution

This parameter defines decimal point position and resolution in force display.

The decimal point position selected here will be used in setting up, in the displayed force value and in the force value sent to a printer or computer. Resolution is understood to mean the smallest force change presented. In the INDI-ISO376 this would normally be 0.00001 for mV/V and 0000.01 for μ V/V

Capacity

This parameter defines the nominal range of the unit. This is the capacity of the unit and should be set to the maximum mV/V reading with which the unit is to be loaded. Nominally the standard INDI-ISO376 is set to 3.3mV/V and the optional 7mV/v unit set to 7mV/V.

4.2. Table calibration

This is performed by entry of recorded force values and corresponding transducer signal values into the instrument. Calibration can be performed for up to 6 points. The accuracy of the copying procedure is 0.005 %.

Number of cal.points.

Only parameters for the selected number of calibration points will be displayed in the menu. The number of calibration points can be changed during the calibration.

Value cal. p.1, Value cal. p.2 etc.

These parameters are used for entry of recorded force values, expressed in the measurement unit.

Transd.sign. p.1, Transd.sign. p.2 etc.

These parameters are used for entry of recorded transducer signal values for corresponding calibration points.

To terminate Table calibration, function key BACK, and then EXIT, should be pressed. In menu 'Exit set-up' the values can be saved (or not saved) and that terminates the calibrating operation.

5. OPERATION

5.1. General

Force Indicator INDI-ISO376 is designed specifically for force measurement purposes. The measurement value is displayed on the front panel, and can also be transmitted to a master computer/PLC, display units, or printers. The measurement value can also be presented as the output signal from an analogue output module, connected as additional unit. Some functions in INDI-ISO376 can be controlled by digital input signals, and several digital outputs from the instrument are provided. The number of inputs and outputs may be expanded by connection of additional I/O units, controlled by parameters in INDI-ISO376.

5.2. Power supply

The force indicator is powered by 24 VDC or 110v/240v mains in cased versions and should not be turned off during week-ends and over-night. Continuous power supply to electronics and transducers prevents moisture condensation in the units.

5.3. Power-up sequence

As INDI-ISO376 is started it enters the Starting up state, displaying programme name and serial number for some seconds.

If any error is detected during power-up, the sequence stops and an error code will be displayed. See section 10. Troubleshooting for further information.

If no errors are detected, INDI-ISO376 can enter normal operation (automatic start-up), displaying actual force value, possibly together with other instrument information. If 'Manual start-up' is selected, INDI-ISO376 enters the 'Wait for start' state, displaying the text 'Press ENTER to start operation!'. If a warm up time has been set, the text 'Warming up Please wait!' will be displayed until the warm up time has expired. Then the instrument will switch over to normal operation by 'automatic start-up' or 'manual start-up'.

5.4. Display variations

When INDI-ISO376 is in normal operation, the measurement value can always be transmitted to connected external units. Normally the value is also displayed at the INDI-ISO376 front panel, but display of other information can also be selected. See under 'Main menu'

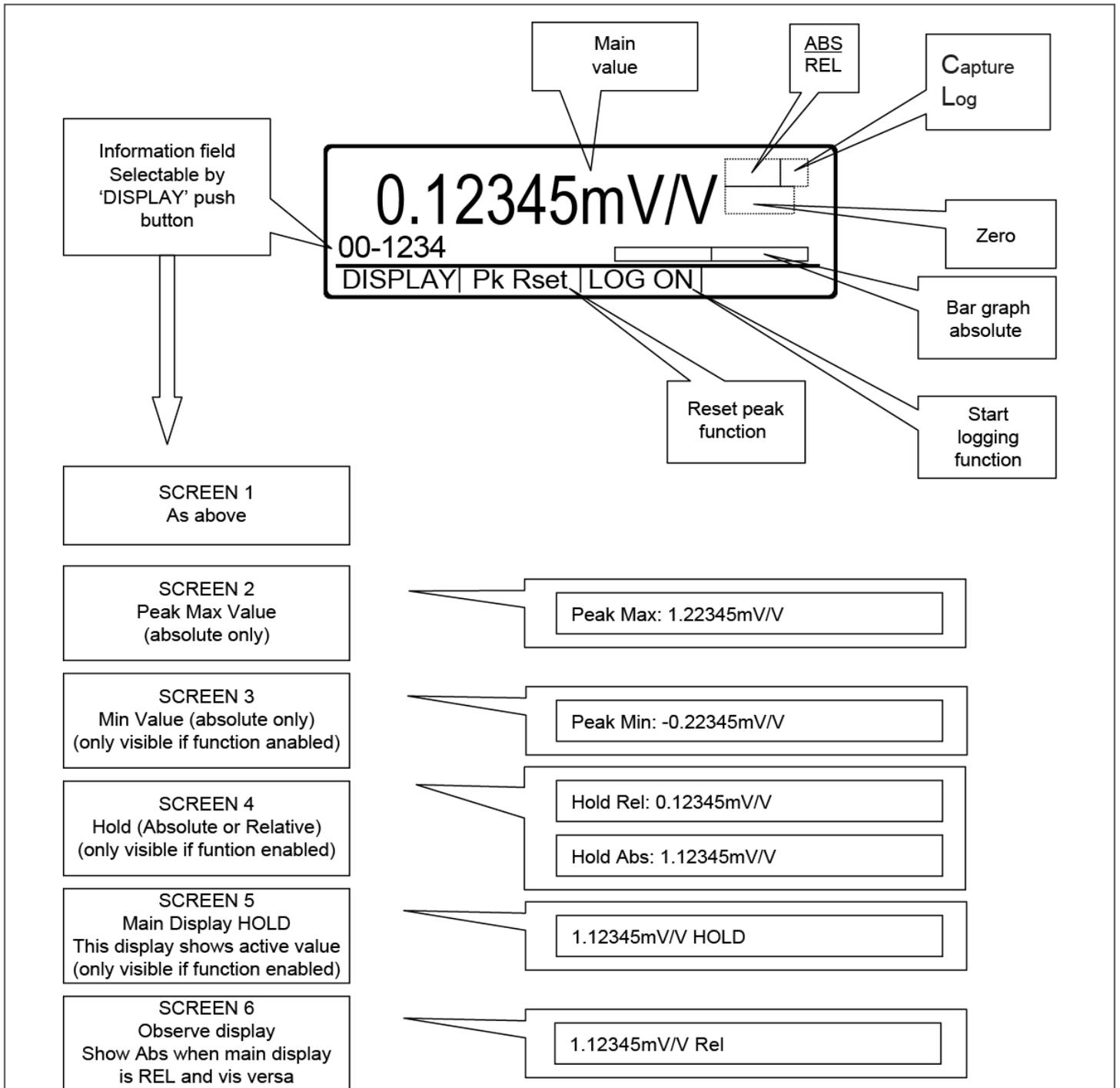
On the INDI-ISO376 front panel the measurement value is displayed in numerical form, with the selected measurement unit and decimal point position. A graphic bar, representing the actual absolute force, may also be displayed. Maximum length of the bar corresponds to the instrument capacity.

Additional information about the measurement value may be displayed to the right:

- | | |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Rel | Relative force is displayed
(Relative force = absolute force –relative zero value). |
| Abs | Absolute force is displayed. |
| Hold | Hold the displayed force value. |
| Motion | The measurement value is not stable, according to INDI-ISO376 settings. When it becomes stable 'Motion' disappears after a set delay time. |
| Print | Printing is performed. If 'Print' is flashing INDI-ISO376 is waiting for stable force to start the commanded printing. |

5.5. Information line

More additional information can be displayed on a separate line, together with the measurement value



5.6. Hold Function

The hold function enables the INDI-ISO376 to 'HOLD' or freeze a reading on the display. The lower of the four front panel green pushbuttons will operate this function or if either of the digital i/o has been configured for HOLD, then an external pushbutton may be used.

When the function is triggered the INDI-ISO376 will switch to SCREEN 5 which shows the 'HOLD' value in the MAIN field and the active value in the INFORMATION field. Set-up parameters can be configured to automatically output to a printer (if fitted) the 'HOLD' value.

This value will remain in the HOLD register until another value is held. Switching to other information fields will not affect this value. The 'HOLD' value is accessible via the MODBUS interface for recording by a PC/PLC. See chapter 6 for details of MODBUS INTERFACE.

The hold function is enabled in the FUNCTION Menu. The HOLD readings are volatile so will be lost when power is switched off.

5.7. Peak Function

The INDI-ISO376 will constantly record the maximum value positive and the maximum value negative. Information screens 2 and 3 will show these values when the function is enabled via the FUNCTION MENU. The values are internal absolute values, so if any ZERO offset is used it will not alter the peak readings. Pressing the up arrow will reset the reading to the current value. The values are accessible via the MODBUS interface for recording by a PC/PLC. See chapter 6 for details of MODBUS INTERFACE.

5.8. Logging Function

This function allows a printer to be connected to one of the serial ports and automatically print out the force value at regular intervals. Time intervals of between 1 and 99 minutes may be set. If the serial port is connected to a PC running HYPER TERMINAL or similar package the readings may be saved in the computer for further analysis. The function is enabled via the FUNCTION menu.

Example of the logging function

Ensure printer is connected and functioning.

In the FUNCTION menu select LOG on and 2 min intervals.

At the main display press LOG ON to start the logging.

The push button label now changes to LOG OFF to change its function.

An 'L' appears at the top right hand corner of the main display to show that the logger is on.

The printer will printout the first reading at once.

At every 2 minutes after that the printer will print again

At the main display press LOG OFF to stop the logging.

During the time the logger is on the PRINT key is still operational.

5.9. Stored Print Function

This function is used to record up to 10 readings along with the time for printing out at a later time. A menu also shows the operator the stored values, which can be cleared or printed. The function key F3 gives the operator a short cut to this menu. The readings are permanently stored in the INDI-ISO376 even after power down. If this function is enabled then the PRINT indicator on the main display will show STORED instead of PRINT and the new data recorded in the next available position along with the date and time

5.10. Capture function

The CAPTURE function allows the INDI-ISO376 to capture up to 100 consecutive readings and store them for down loading into a PC/PLC or printer. The capture may be triggered from either a digital input, when the force is greater that the Capture value (Cap Lev) or when above either of the levels (Lev 1 and Lev 2). The function key F2 gives the operator a short cut to this menu. These readings are lost when power is removed from the INDI-ISO376 or when resetting the instrument after changing set-ups.

Example of the use of the capture function

Ensure force reading less than 1.00000mV/V.

In the FUNCTION menu select CAPTURE on, trigger type to Cap Lev and 10 capture readings.

In the FUNCTION menu set CAPTURE LEVEL to 1.00000mv/v.

At the main display press F2 to show the CAPTURE menu.

Press CLEAR

Press <- to return to the main display.

Increase the force to above 1.0000mV/V.

At the main display press F2 to show the CAPTURE menu.

Observe the captured readings, sequencing up and down using the appropriate arrows. Press the PRINT button to output to a connected printer or access the registers via the MODBUS.

5.11. Security locks

In INDI-ISO376 two security locks are included to prevent unauthorised editing via the panel keys. The locks can be activated by parameters in menu 'Edit set-up/General'.

'Operator lock' prevents opening of the instrument Main menu and the Batching menu, thus protecting all set-up parameters and values in the instrument from editing.

'Set-up lock' prevents entry in menu 'Edit set-up' and 'Batching parameters', thus protecting all set-up parameters in INDI-ISO376 from editing. But other menus in the instrument Main menu are still available. For example instrument name, Edit levels, and Clock set-up.

5.11.1. Codes for the security locks

When a security lock is activated the operator must enter a four digit code to get access to the protected area. By default the valid code for both locks is '1 9 3 7', but the locks are not activated. In menu 'Edit set-up', sub menu 'General', parameters are available to activate the locks and to change the default code to any four digit code.

The code for the Operator lock can only open the Operator lock. The code for the Set-up lock will open both Set-up lock and Operator lock.

5.12. Relative zeroing

Relative zeroing means storing of the present force value and subtracting it from the active reading. Thus giving a RELATIVE reading from the time of zeroing. The relative force being the absolute force minus the stored value.

'Relative Zero' value is the actual absolute force, stored as zero value when the RELATIVE ZERO key is pressed.

With default setting, relative zeroing of INDI-ISO376 can be performed, even if the force is not stable. But if parameter 'Motion check' in 'Edit set-up/Calibration parameters' is set to 'On', relative zeroing will be allowed only when the force value is stable.

If Calibration parameter 'Over load check' is set to Unipolar, relative zeroing is not allowed at negative absolute force.

5.13. Absolute/relative operation

At normal operation INDI-ISO376 presents a numerical force value at the display, either absolute force or relative force. When relative force is displayed the text 'Rel' is added to the right of the value and 'Abs' when absolute force is displayed. Pressing the Abs/Rel key can perform toggling between display of absolute force and relative force.

Absolute force is continuously shown in form of a graphic bar at the display. Maximum length of the bar corresponds to the set Capacity of the instrument (ie 3.3mV/V or 7mV/V).

Relative force cannot be displayed if the relative zero value in use is zero (0).

5.14. Motion

The text 'Motion' may be shown to the right in the display. This will happen for an unstable force value if it has changed by more than the set 'Motion detect w.' between two internal force calculations (one-tenth of the filter time). After the force becomes stable, the text 'Motion' will still be shown for a short time, specified in parameter 'No-motion delay'. INDI-ISO376 will regard the force as unstable until the text 'Motion' has disappeared.

When the text 'Motion' is shown, the following activities are affected:

- Relative zeroing cannot be obtained (applies if 'Motion check' is 'On').
- Printout of forces or storing if STORED PRINT enabled, is delayed until stable force is obtained (applies if 'Motion check' is 'On').

5.15. Print function

5.15.1. General

A printer must be connected to one of the INDI-ISO376 serial communication ports and the communication parameters must be correctly set. See section 6. Communication and section 3. Set-up.

5.15.2. Printing of displayed force

The displayed force value in INDI-ISO376 can be printed out on a connected printer, but on certain conditions:

- If parameter 'Motion check' in menu 'Edit set-up/Calibration parameters' is set to 'On', the displayed value must be stable ('Motion' not shown). Parameter 'Motion detect w.' in the same sub menu defines "stable force". If the force is not stable ('Motion' shown), printing will be delayed and the text 'Print' will be flashing. When the force has become stable ('Motion' not shown) printing will be performed.
- If STORED PRINT is enabled in the SPECIAL MENU the displayed force is stored for future printing.

5.15.3. Other printouts

A printer, connected to INDI-ISO376, can also be used for printing of other data for the instrument.

Printing of Level and Setpoint values

If PRINT is pressed when sub menu 'Edit levels' is open, and editing is not performed, the actual values for the Levels and Setpoints in use will be printed out, together with actual date/time and Instrument name for the INDI-ISO376.

Printing of set-up parameter values

If PRINT is pressed when sub menu 'Show set-up' or 'Edit set-up' is open, printing of a complete list of all set-up parameter values can be performed. The printout will take several minutes to conclude.

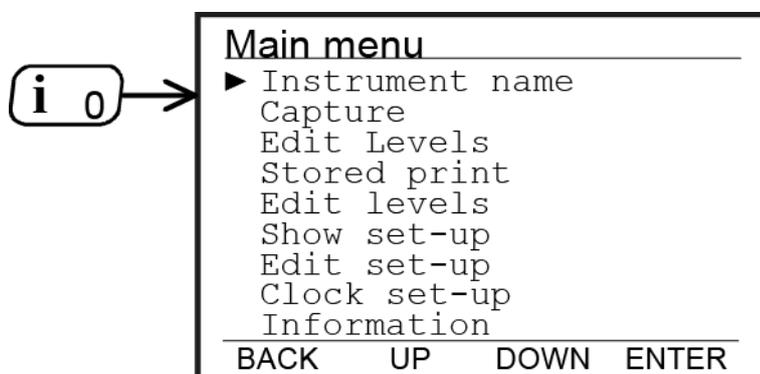
Printing of stored print values

If PRINT is pressed when sub menu 'STORED PRINT' is open, printing of all the recorded values and their recorded time can be performed.

Printing of captured values

If PRINT is pressed when sub menu 'CAPTURE' is open, printing of all the recorded values can be performed. As the list may be up to 100 readings, the printout will take several minutes to conclude.

5.16. Main menu



When INDI-ISO376 performs normal weighing, the instrument Main menu can be opened without interrupting the weighing operation.

Press digit key 0, also marked i, to open the instrument Main menu. If the 'Operator lock' is activated, INDI-ISO376 will request the four digit 'Operator code' to allow entry in the instrument Main menu.

In the instrument Main menu, several sub menus are available for display of other information or for entry of new values.

Figure 11 : In the instrument Main menu a sub menu can be selected by the cursor and then opened by function key ENTER

- Instrument name: A name to identify the instrument in printed reports etc.
See page 5-11.
- Edit levels: Edit Level values and show Setpoint values.
See page 5-9 and
- Capture: Show values captured.
See section 3. Set-up.
- Show set-up: Show all used set-up parameter values.
See section 3. Set-up.
- Edit set-up: Edit set-up parameter values.
See section 3. Set-up.
- Clock set-up: Setting of actual date and time.
See section 5. Operation
- Information: Show some important instrument data.
See section 5. Operation

5.16.1. Instrument name

In this sub menu an instrument name can be entered. This name can serve to identify the instrument in printouts. The instrument name can be made up of digits, upper case letters, and lower case letters.

5.16.2. Edit levels

In this menu actual supervision levels for the used Level are shown and can be edited. Used Setpoint values are also shown, but can only be edited from a master computer/PLC.

Editing of a Level value is performed like for “numerical” set-up parameters. The Level value can be set positive or negative up to 10, using the measurement unit that is set for the instrument.

5.16.3. Capture

This menu shows the CAPTURE registers. The top line indicates the status of the function: pressing F1 will toggle the set-up that determines whether it is ENABLED or DISABLED.

As there may be up to 100 readings to show, the menu utilises a pointer system and shows the pointer position (Capture Posn) and the pointed register (Capture Value). Pressing the UP and DOWN arrows will alter the Capture Posn pointer and sequence through the readings.

Pressing the CLEAR push button clears all the readings

If PRINT is pressed and a printer enabled, printing of all the recorded values can be performed.

5.16.4. Stored print

This menu shows the 10 STORED PRINT registers. The top line indicates the status of the function: pressing F1 will toggle the set-up that determines whether it is ENABLED or DISABLED.

Pressing the UP and DOWN arrows will sequence through the readings.

Pressing the CLEAR push button clears all the readings

If PRINT is pressed and a printer enabled, printing of all the recorded values can be performed.

5.16.5. Show set-up

All set-up parameters in INDI-ISO376 are arranged in menus. In this sub menu the setting of all set-up parameters can be shown, but the values cannot be edited.

5.16.6. Edit set-up

All set-up parameters in INDI-ISO376 are arranged in menus. In this sub menu the setting of all set-up parameters can be shown. Parameter values can also be edited.

5.16.7. Clock set-up

Date and time information can be presented at the INDI-ISO376 display and in printouts from the instrument. Setting of correct date and time is performed in ‘Clock set-up’, a sub menu to the instrument Main menu.

Editing of data in ‘Clock set-up’ is performed like for other “numerical” parameters.

Settings are available for: Year (up to 2095), Month (1 – 12), Day (1 – 31), Hour (0 – 24), and Minute (0 – 60).

5.16.8. Information

In sub menu Information some important data and measured live values for INDI-ISO376 are displayed. No values can be edited in this menu.

Information: (instr. name) 001	
COM1:9600	1.58248mV/V
COM2:9600	1.58245mV/V
A1:13.51 mA D1:OK Prg:T510A220	
A2: 5.27 V D2:-- S/N:00-1234	



On the first line the instrument name and instrument address are shown.

On the second and third lines, to the left, baud rates are shown for the serial communication ports Com 1 and Com 2. When a correct message is received on Com 1 or Com 2, the text COM1: and COM2: respectively flashes.

On the second and third lines, to the right, actual absolute force value and transducer signal in mV/V is shown.

On the bottom lines, to the left, actual output signals from the analogue output units in use are shown. If a used analogue output unit is out of order, this is indicated by a broken line.

On the bottom lines, in the middle, status for the DIO units in use is shown as 'OK' or '--' (error).

On the bottom lines, to the right, the instrument's programme name and serial number are shown.

Press the function key marked ← or the key ↶ to switch INDI-ISO376 back to the instrument 'Main menu'.

5.17. Level supervision

INDI-ISO376 contains eight supervision Levels that can be used to supervise defined signals in the instrument. Both internal and external digital outputs can be connected as outputs for the Levels. For each Level, hysteresis and operation mode for the digital output is controlled by set-up parameters.

Functions for Level supervision are defined in menu 'Edit set-up' by parameters in the sub menus 'Level supervision' and 'Outputs'.

'Level X source'

In sub menu 'Level supervision', parameters are available to set each Level to 'Not in use', or to define the input signal for the Level.

Select 'Relative force' or 'Absolute force' to supervise these force values, independent of which force that is actually displayed. Select 'Disp. force' to supervise either absolute force or relative force, depending on which force that is actually displayed.

Select 'Abs. relative.w.', 'Abs. absolute.w.' or 'Abs. disp.w.' to act on the absolute value of these signals, i.e. the value independent of polarity.

The 'source' parameter for Level 2 – Level 8 can also be set to 'Offset lev.1'. Then that Level will use the same input signal as Level 1. The supervised level will be at a fixed offset from Level 1, defined by 'value' for the Level.

If a value other than 'Not in use' is selected for a Level, more parameters for that Level will be shown.

'Level X outp.':

Defines how a digital output, if connected to the Level, should operate. The parameter can be set to make an output active when the signal is above the Level, or when it is below the Level.

‘Level X hyst.’:

Defines the width of a hysteresis range for the Level. The definition of a negative hysteresis range starts with a minus sign(-). Hysteresis is an intentional difference between the switch levels for increasing and decreasing signal level. One switch level is always at the defined Level. The other switch level is at a higher level by positive hysteresis, at a lower level by negative hysteresis. See figure 22.

Level status

Actual status of the Levels (input signal above or below Level) can be read via the serial communication.

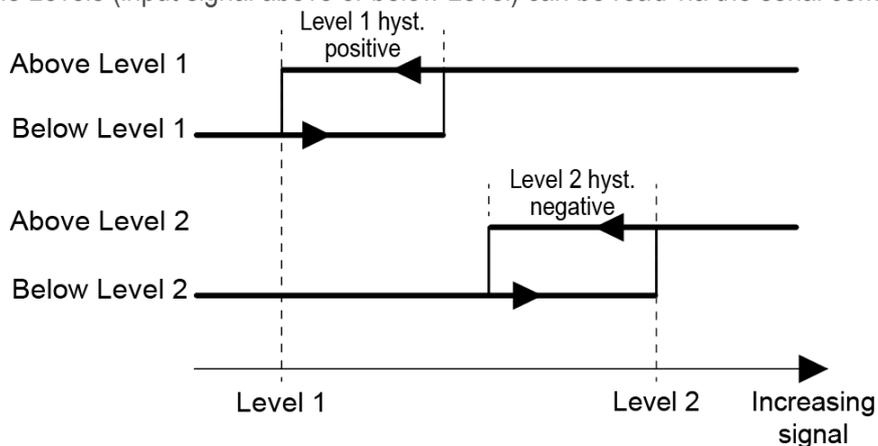


Figure 12 : Influence on the level supervision from positive hysteresis, for Level 1, and negative hysteresis, for Level 2.

5.18. Setpoint function

5.18.1. General

The two Setpoints can be used for fast, accurate and reliable supervision of force values. The Setpoint function is of a one shot type, the function is activated by a command from the master computer/PLC and deactivated when the force has reached the Setpoint value.

The Setpoints can be connected to any digital output in the INDI-ISO376 system for flexibility. The status of the Setpoints can be found in Modbus register “Status 2”.

The Setpoints can only be controlled by a master computer/PLC via serial communication. The Setpoint is loaded into the Modbus registers using Modbus function 06 or 16. Commands can be sent to the instrument by loading the command number in the Modbus “Command register” or by setting the corresponding “Coil”, using Modbus function 15.

NOTE: To ensure good operation during the time when a setpoint is activated, the zero-tracking function is not working.

5.18.2. Set-up

The selection of the setpoint functions is made in set-up parameter “Setpoint 1 source” and “Setpoint 2 source”. In these set-ups you can select which signal (force value) the setpoint shall act on.

Connection of a setpoint to an output is made in set-up menu “Outputs”.

5.18.3. Operation

The wanted setpoints (force levels) must be loaded into the Modbus registers called ‘Setpoint 1 value’ and ‘Setpoint 2 value’.

The setpoint(s) are activated by sending command “Activate setpoint 1”, “Activate setpoint 2” or “Activate setpoint 1 and 2” to the instrument (command 1, 3 and 5). If a setpoint is connected to an output, then corresponding digital output is activated.

When the selected force becomes higher than the setpoint the setpoint function is deactivated and the corresponding “Setpoint cycle done” bit is set. A possible connected digital output is also deactivated at the same time.

The setpoint function, and possible connected digital outputs, can also be deactivated by sending command “Deactivate setpoint 1”, “Deactivate setpoint 2” or “Deactivate setpoint 1 and 2” (command 2, 4 and 6).

NOTE: The “Setpoint cycle done” bit for a setpoint is reset when the setpoint value is loaded and when the setpoint is activated.

5.19. Use of inputs and outputs

Internal I/O's are included in INDI-ISO376, two digital inputs and two digital outputs. Additional digital I/O units and analogue output units can be connected, communicating with INDI-ISO376 by 'I/O bus' through serial port Com 2. Each unit can be set to I/O unit 1 or 2, Analogue output 1 or 2 respectively.

All input and output functions are controlled by set-up parameters in INDI-ISO376. Parameter editing can only be performed in sub menus to 'Edit set-up', when normal measuring functions are interrupted.

5.19.1. Digital inputs

Inputs 01 and 02 are the internal digital inputs in INDI-ISO376. Inputs 11 – 18 and 21 – 28 are the digital inputs to INDI-ISO376 via additional I/O unit 1 and I/O unit 2 respectively.

The digital inputs can be used for remote operation of the instrument. Digital input functions are defined by parameters in sub menu 'Inputs'.

5.19.2. Digital outputs

Outputs 01 and 02 are the internal digital outputs from INDI-ISO376. Outputs 11 – 18 and 21 – 28 are the digital outputs from INDI-ISO376 via additional I/O unit 1 and I/O unit 2 respectively.

The digital outputs can be used for control of external equipment and for indication of instrument status. Digital output functions are defined by parameters in sub menu 'Outputs'.

5.19.3. Analogue outputs

To produce analogue outputs from INDI-ISO376, one or two additional units must be connected to serial communication port Com 2.

The analogue output signal will represent a selected signal in INDI-ISO376 in form of an analogue current or voltage signal. All analogue output functions are defined by parameters in sub menu 'Analog outputs'.

5.20. Filter function

In INDI-ISO376 the force value is produced in two forms, unfiltered and filtered. The unfiltered force value represents the transducer load with the smallest delay. This means that the instrument will respond rapidly to load changes, but the force display will be unstable if the load is fluctuating. The filtered force value will give a smoother force display, but the response on load changes will be delayed.

Filter window (filtered force – unfiltered force). The instrument can automatically switch between unfiltered and filtered force in order to make the force display fast when the load changes, but stable for constant load. The difference between the two latest filtered force values is checked and parameter 'Filter window' defines at which difference the switch over should take place. If the difference is smaller than 'Filter window', the filtered force will be used.

Filter function (filtered force). The parameter 'Filter type' can be used to make the filtered force value respond more slowly or more rapidly to changing loads. The filtered force is a true mean value of the force value during one filter time period. If the is fluctuating, a prolonged filter time can be set in order to obtain a more stable force display.

The instrument calculates a filter time (standard), based on the actual calibration, as a reference value for the other fixed filter times.

- If 'Filter type' is set to Standard (default) the instrument will select the calculated filter time.
- If 'Filter type' is set to Long the instrument will select a filter time, four times the calculated filter time.
- If 'Filter type' is set to Short the instrument will select a filter time, one fourth of the calculated filter time.
- If 'Filter type' is set to Special a filter time value can be entered for parameter 'Filter time'.
-

In all these cases 'Filter time' will be automatically set to the nearest higher value that is a multiple of 200ms (50 Hz) or 166.67ms (60 Hz). The range for 'Filter time' is 167 – 20 000ms.

The instrument updates the internal force 10 times per Filter Time Period, implying that:

- Force Conversion Time = 'Filter time' / 10.
- Settling time for unfiltered force is 2 – 3 times 'Filter time' / 10.

At calibration INDI-ISO376 will calculate and set the filter time automatically. The instrument measures the sense voltage as a parameter for this calculation, so table or data sheet calibration without actual transducers connected will produce a random result. To set a filter time value under these conditions, use filter type special and enter the wanted value. With data from the installation entered in the formula below and the result applied in the diagram on next page, the expected standard filter time will be found. The variation in sense voltage caused by the number of transducers is shown in the diagram for low cable resistance. High cable resistance has the same influence direction as more transducers. Higher sense voltage caused by the use of external excitation will give lower filter time.

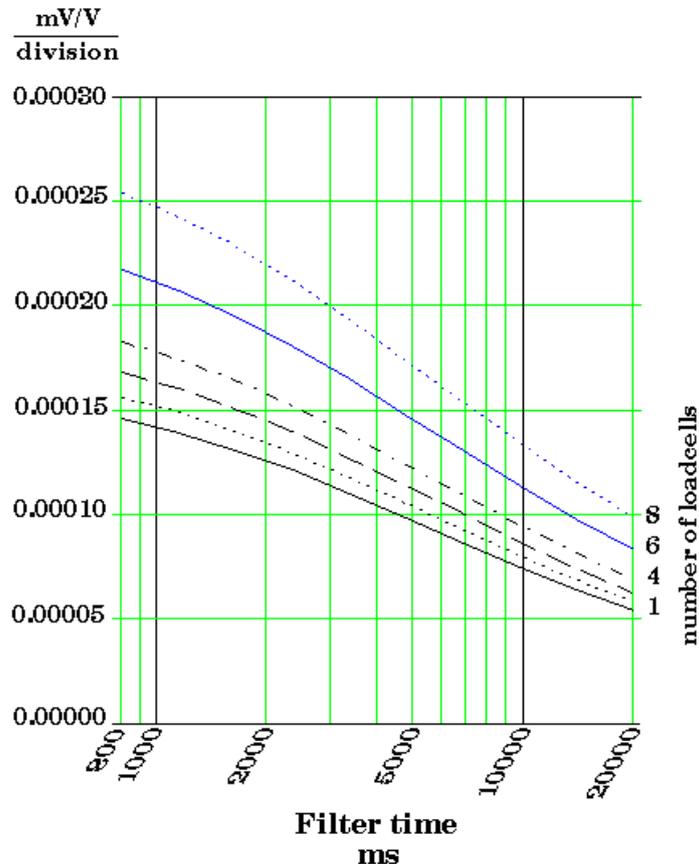


Figure 13 : mV/V to division'

Formula to get 'mV/V to division':

$$\frac{\text{resolution} * \text{transducer rated output} * \text{conversion factor}}{\text{number of transducers} * \text{rated load}} = \frac{\text{mV/V}}{\text{division}}$$

'Transducer rated output' is the mean value of Rated output at rated load for all connected load cells.

Example:

$$\frac{0.2\text{kg/div} * 2.039\text{mV/V} * 9.80665\text{N/kg}}{3 * 20000\text{N}} = 0.000067 \frac{\text{mV/V}}{\text{division}}$$

With 3 transducers this will make the filter time 20000ms. To make the FTS faster, select filter type 'Short' (5000ms) or filter type 'Special' and then a suitable filter time. Another way is to set Resolution to 0.5kg, which will make the filter time 800ms.

5.21. I/O bus connection

Additional units with input and output functions can be used together with INDI-ISO376. These units, described in section 9, communicate through serial port Com 2 by the "I/O bus", a Modbus protocol on RS-485.

Up to four additional units can be connected to Com 2.

When Com 2 shall communicate with additional units over the I/O bus, parameter 'COM2: Mode' in menu 'Edit set-up/Communication' must be set to 'I/O bus'. This setting will make parameters for two more communication ports, COM3 and COM4, available.

6. COMMUNICATION

INDI-ISO376 has two serial communication ports, primarily used for communication with a control unit. Alternatively they can be used for data transmission to an external display, printer or I/O modules (Com 2 only).

6.1. Communication interface

INDI-ISO376 is equipped with 2 serial communication ports: Com 1, Com 2. Com 1 has both RS-232 communication, using a 9-pole D-sub socket at INDI-ISO376, and RS-485 communication (can't be used simultaneously). Com 2 communicates by RS-485 only.

The serial communication utilises RS-485 for 2-wire or 4-wire. RS-485 is an interface working with differential voltages, giving a noise resistant transmission in a network with several units and long distances. The host computer (master) must have an asynchronous communication port for RS-485, or use a converter, e.g. Westermo MA-42 for RS-232 to RS-485 conversion. If 2-wire transmission is used, the control unit must be capable of data flow direction control or utilise a converter for automatic data flow direction control e.g. Westermo MA-44. When 4-wire transmission is used, no data flow direction control is needed.

When the RS-232 port is used it's possible to communicate with one INDI-ISO376 directly from a PC without using a converter.

6.2. Transmission principles

All the INDI-ISO376 units connected to the network can listen to what is transmitted in the network, but only one unit at a time may transmit. A time sharing principle is needed to allow communication in both directions (half duplex).

All communication in the network must be initiated by the control unit (master). When INDI-ISO376 is working together with a master the INDI-ISO376 units are all slaves, only allowed to reply to master commands. When the master has addressed a command message to a specific slave unit, it listens for the reply during a specified time, before sending next command message. If the reply from a slave unit fails it may be due to:

- Mismatch in communication parameters. (Baud rate, address...)
- More than one slave unit has been transmitting at the same time. This can distort the reply message and make it impossible to decode.

6.3. I/O bus

When more in/out functions are needed (digital I/O, analogue outputs or serial communication ports), additional I/O units can be connected to INDI-ISO376.

When additional I/O units are used, Com 2 is occupied for this purpose. See section 9. Additional units.

6.4. Modbus

6.4.1. General

For communication with a master computer (PLC) the Modbus protocol is used in the INDI-ISO376. The Modbus protocol is a standard protocol, used for master/slave communication in the industry. The INDI-ISO376 implementation works with the Modbus RTU format (the ASCII format is not supported).

Information is transmitted in blocks of data to minimise polling and response time delays. For example both the error register, status register and force register could be read with one command to the INDI-ISO376.

When a command that cannot be performed is sent, the INDI-ISO376 responds with an exception code. For a better explanation of the error, a special error register could be read.

Depending on the type of the communicating equipment (the master), the commands in the application programme (PLC programme, or pc programme) may be different from type to type. However, if the master is not a Modicon PLC system, then the Modbus implementation in the master must have some cross-reference function to transfer the Modbus register and I/O bit numbering to the masters own register and I/O bit numbering. All registers and coils described in this manual use the standard Modbus (Modicon) register and I/O numbering. See the masters own Modbus driver documentation for how the commands should be activated in the master application programme.

Most manufacturers of PLC systems and HMI and SCADA software can provide Modbus drivers. Various Modbus drivers for development of Windows programs are also available on the market.

For detailed information about the Modbus protocol, see: Modicon Modbus Protocol Reference Guide PI-MBUS-300 Rev.D.

6.4.2. Setup of Modbus communication

- Set parameter 'COMx:Mode' (in 'Edit set-up', menu 'Communication') to 'Modbus auto'. The baudrate and bit settings will be autodetected.
- The INDI-ISO376 will as default be given the address 1. If more than one INDI-ISO376 is used in a network, each INDI-ISO376 must be given a unique address in parameter 'Instrum. address'.
- When longer response times are needed, set 'COMx:Mode' to 'Modbus' and select the correct 'Baudrate' and 'Data format'. See Technical data.

6.5. Register description

INDI-ISO376 has a number of Modicon 'Holding Registers' (registers 4XXXX ...). The Modbus function 03 'Read Holding Registers' should be used to read these register and the Modbus function 05 'Preset Single Register' or 16 'Preset Multiple Registers' should be used to write to the registers. See section 'Data representation' for a description of the different data formats used.

Hint: To find out which of the float formats that should be used, read the 'Instrument type' register (40200/45200) which equals '2003' for INDI-ISO376.

6.5.1. General registers

Data type: Integer	Data type: Float (2 reg./value)	Data type: Modicon float (2 reg./value)	Explanation	R/W
40001 (1 reg)	40200	45200	Instrument type	R
40002 (1 reg)	40202	45202	Program number	R
40003 (1 reg)	40204	45204	Program version	R
40004 (3 reg)	40208	45208	Serial number	R
40007 (1 reg)	40210	45210	Command error	R
40008 (1 reg)	40212	45212	Instrument state	R
40009 (1 reg)	40214	45214	Instrument error	R
40010 (1 reg)	40216	45216	Status 1	R



Data type: Integer	Data type: Float (2 reg./value)	Data type: Modicon float (2 reg./value)	Explanation	R/W
40011 (1 reg)	40218	45218	Status 2	R
40012 (3 reg)	40220	45220	Absolute force	R
40015 (3 reg)	40222	45222	Relative force	R
40018 (3 reg)	40224	45224	Hold Value	R
40021 (3 reg)	40226	45226	Analogue outp. value 1	R
40024 (3 reg)	40228	45228	Analogue outp. value 2	R
40027 (3 reg)	40230	45230	Input signal (mV/V)	R
40030 (1 reg)	40232	45232	Command register	R/W *
40031 (3 reg)	40234	45234	Setpoint 1 value	R/W
40034 (3 reg)	40236	45236	Setpoint 2 value	R/W
40043 (1 reg)	40242	45242	External input status	R/W**
40044 (1 reg)	40244	45244	External output status	R/W**
40045 (1 reg)	40246	45246	Level status	R/W**

*/ The read value is always 'zero'.

**/ Write to these registers is allowed, but has no effect!

Important:

'Relative force' and 'Absolute force' registers are only valid when 'Instrument error' register equals 0. Therefore it's recommended to read the 'Instrument error' register together with these registers.

6.5.2. General registers cont.

Data type: Integer	Data type: Float (2 reg./value)	Data type: Modicon float (2 reg./value)	Explanation	R/W
44003 (3 reg)	41802	46802	Clock: Year	R/W
44006 (3 reg)	41804	46804	Clock: Month	R/W
44009 (3 reg)	41806	46806	Clock: Day	R/W
44012 (3 reg)	41808	46808	Clock: Hour	R/W
44015 (3 reg)	41810	46810	Clock: Minute	R/W
44039 (3 reg)	41826	46826	Level 1 value	R/W
44042 (3 reg)	41828	46828	Level 2 value	R/W
44045 (3 reg)	41830	46830	Level 3 value	R/W
44048 (3 reg)	41832	46832	Level 4 value	R/W
44051 (3 reg)	41834	46834	Level 5 value	R/W
44054 (3 reg)	41836	46836	Level 6 value	R/W
44057 (3 reg)	41838	46838	Level 7 value	R/W
44060 (3 reg)	41840	46840	Level 8 value	R/W
44063 (3 reg)	41842	46842	NOT USED	R/W
44066 (3 reg)	41844	46844	Setpoint 1.	R/W
44069 (3 reg)	41846	46846	Setpoint 2	R/W
44072 (3 reg)	41848	46848	Stored Print 1 Value	R/W
44075 (3 reg)	41850	46850	Stored Print 1 Time	R/W
44078 (3 reg)	41852	46852	Stored Print 2 Value	R/W
44081 (3 reg)	41854	46854	Stored Print 2 Time	R/W
44084 (3 reg)	41856	46856	Stored Print 3 Value	R/W
44087 (3 reg)	41858	46858	Stored Print 3 Time	R/W
44090 (3 reg)	41860	46860	Stored Print 4 Value	R/W
44093 (3 reg)	41862	46862	Stored Print 4 Time	R/W



Data type: Integer reg./value)	Data type: Float (2 reg./value)	Data type: Modicon float (2 reg./value)	Explanation	R/W
44096 (3 reg)	41864	46864	Stored Print 5 Value	R/W
44099 (3 reg)	41866	46866	Stored Print 5 Time	R/W
44102 (3 reg)	41868	46868	Stored Print 6 Value	R/W
44105 (3 reg)	41870	46870	Stored Print 6 Time	R/W
44108 (3 reg)	41872	46872	Stored Print 7 Value	R/W
44111 (3 reg)	41874	46874	Stored Print 7 Time	R/W
44114 (3 reg)	41876	46876	Stored Print 8 Value	R/W
44117 (3 reg)	41878	46878	Stored Print 8 Time	R/W
44120 (3 reg)	41880	46880	Stored Print 9 Value	R/W
44123 (3 reg)	41882	46882	Stored Print 9 Time	R/W
44126 (3 reg)	41884	46884	Stored Print 10 Value	R/W
44129 (3 reg)	41886	46886	Stored Print 10 Time	R/W
44132 (3 reg)	41888	46888	Capture Value	R/W
44135 (3 reg)	41890	46890	Capture Position	R/W
44138 (3 reg)	41892	46892	Peak Positive	R
44141 (3 reg)	41894	46894	Peak Negative	R

6.5.3. String registers

Data type: string	Explanation	R/W
44696 (6 reg)	Instrument name	R/W

Stored Print X Time String is 12 characters long and may be either all spaces (Hex 20) or as follows (Example Stored Print 3 Time String time = 11:59). All 6 registers must be written to with the same command.

```

44648      44649      44650      44651      44652      446563
Sp   sp   1     1     :     5     9     sp   sp   sp   sp   sp

```

6.5.4. Instrument type

This register holds the type of the instrument. For INDI-ISO376 this value is 2003.

6.5.5. Program number

This register holds the program number of the INDI-ISO376.

6.5.6. Program version

This register holds the program version of the INDI-ISO376. The value 100 means 1.00. INDI-ISO376 program referred to with this manual is be T510A211 so the program version is 211.

6.5.7. Serial number

This register holds the serial number of the instrument. The value 991000 means 99-1000. This can be used by the master to be sure that an instrument with a specific serial number is used for a special process.

6.5.8. Command error

This register holds the error code when a command has been sent to the INDI-ISO376. A command that gives a 03 or 07 as exception will have an error code with a better description of the problem in this register.

For an explanation of the error codes see section 10 Troubleshooting. Normally this register should contain '00' which means no error. Error codes 100 to 65535 are valid in this register.

6.5.9. Instrument state

This register contains the state of the INDI-ISO376 unit.

Code	Description
00	'Starting up' state. The instrument is starting up after a reset or power on.
01	'Wait for start' state. The INDI-ISO376 is waiting for a start command to go in process.
02	'Normal' state. There are no parameter errors in the system. Note: Force errors still indicates normal state.
03	'Local Set-up' state. Someone is modifying the set-up parameters from the front of the INDI-ISO376. It's not possible to enter Remote Set-up or Remote Restore state from here.
04	'Remote Set-up' state. A master computer is modifying the set-up parameters in the INDI-ISO376. It's not possible to enter Local Set-up state from here.
05	'Remote Restore' state A master computer is restoring set-up data to INDI-ISO376. It's not possible to enter Local Set-up state from here.
06	'Error' state. An error has been detected during start up of the instrument.
07	'Fatal error' state. An error has been detected during start up of the instrument. It's not possible to enter any other state from here.
08	'Test' state. INDI-ISO376 is running in a special mode used for service and production test.
09	'Warming up state' The parameter 'Warm up time' is set to a value other than zero, and INDI-ISO376 is waiting for the warming up time to pass.
99	'Boot' state. The INDI-ISO376 is ready to receive a new program.

6.5.10. Instrument error

This register holds the error code in the INDI-ISO376, for example force, RAM, Flash, EEPROM errors. For an explanation of the error codes see section 10. Troubleshooting. Normally this register should contain '00' which means no error. Error codes 000 to 099 are valid in this register.

6.5.11. Status 1

Bits set to 1 in this register have the following meaning:

Bit no	Function	Comment
0	Relative force > INT size	The relative force in 'scaled integer' format does not fit in one register. (See description of data representation.)

Bit no	Function	Comment
1	Absolute force > INT size	The absolute force in 'scaled integer' format does not fit in one register. (See description of data representation.)
2	Flow rate > INT size	The flow rate in 'scaled integer' format does not fit in one register. (See description of data representation.)
3	Good zero (disp. force)	
4	Good zero Absolute	
5	Good zero Relative	
6	Relative Mode	'1' = Relative mode '0' = Absolute mode
7	Motion	Unstable force
8	Calibration resistor on	Internal shunt resistor connected.
9		
10		
11	Not Used	
12	Relative force > 6 digits	The relative force value is out of precision and should normally not be used.
13	Absolute force > 6 digits	The absolute force value is out of precision and should normally not be used.
14		
15	Calibration edits allowed	

Note: If this register (bits) is read as float value, see description of Data representation.

6.5.12. Status 2

Bits set to 1 in this register have the following meaning:

Bit no	Function	Comment
0	Output 01 activated	Internal relay 1 active.
1	Output 02 activated	Internal relay 2 active.
2	I/O bus error	An error on the I/O bus is present.
3	Analogue output voltage/current	2 '0' = current '1' = voltage.
4	Power failure	The 'power failure' bit is cleared when a 'Read Holding Reg.' (function 03) command reads this register Status 2 (however, the reply contains the set bit, if it was set).
5		
6	RESERVED	Always 0.
7	Digital input 01 activated	24V signal active on digital input 01.
8	Digital input 02 activated	24V signal active on digital input 02.
9	Above Level 1	The force is above Level 1.
10	Above Level 2	The force is above Level 2.
11	Analogue output voltage/current	1 '0' = current '1' = voltage.
12	Setpoint 1 activated	See description of setpoint function.
13	Setpoint 2 activated	See description of setpoint function.
14	Setpoint 1 cycle done	See description of setpoint function.
15	Setpoint 2 cycle done	See description of setpoint function.

Note: If this register (bits) is read as float value, see description of Data representation.

6.5.13. Absolute force

This register holds the absolute force. The force should not be read alone because the status and error codes are stored in other registers. The force is only valid when the register 'Instrument error' equals 00.

A good choice is to read at least the registers 40009 – 40014 (integer) or the registers 40214 – 40221 (45214 – 45221) (float).

Note: When shunt relay is connected, this is the shunt test value.

6.5.14. Relative force

This register holds the relative force. The force should not be read alone because the status and error codes are stored in other registers. The force is only valid when the register 'Instrument error' equals 00.

A good choice is to read at least the registers 40009 – 40017 (integer) or the registers 40214 – 40223 (45214 – 45223) (float).

Note: When shunt relay is connected, this is the shunt test value.

6.5.15. Analogue output value 1, 2

These registers holds the values sent to the analogue outputs. The registers can be used for fault finding in the system. Note: The value is rounded to two decimals.

Input signal (mV/V)

This register holds the current input signal in mV/V. This register could be used for fault finding in the system. It is not the calibrated mV/V reading but the reading prior to calibration adjustments.

When shunt relay is connected, the mV/V change is placed here.

6.5.16. Command register

As this register is read, the answer will always contain only zero's.

There are a number of actions that can be activated in the INDI-ISO376. The value of this register (when different from zero) will activate one of these actions, as described in 'Command description' on next page.

When an action cannot be performed for some reason (wrong state etc.) an exception is given as reply. When an exception with code 03 or 07 is received the command error register could be read to get a better error explanation.

Command description

Cmd	Action activated in INDI-ISO376	Description
0	No action	
1	Activate setpoint 1	See description of setpoint function.
2	Deactivate setpoint 1	See description of setpoint function.
3	Activate setpoint 2	See description of setpoint function.
4	Deactivate setpoint 2	See description of setpoint function.
5	Activate setpoint 1 and 2	See description of setpoint function.
6	Deactivate setpoint 1 and 2	See description of setpoint function.



7	Auto Relative Zero	
8	Set to zero	Used to set the absolute force to zero. USE with caution. Can upset calibrated zero.
9	Select absolute mode	
10	Select relative mode	
11	Select normal force	Disconnect shunt resistor.
12	Select calibration value	Connect shunt resistor.
13	Force display	Show force on the display.
14	NOT USED	
16	Start operation	When the INDI-ISO376 is in 'Wait for start state', this command can be used to start up the instrument.
17	Enter Remote operation	This command disables the keys on the INDI-ISO376 unit. This means that an external computer is controlling the instrument. This command is only valid when INDI-ISO376 is displaying force.
18	Exit Remote operation	This command enables the keys and leaves the remote operation.
19	Print command	This command initiates a printout on a possible connected computer.
75	Capture	This commands initiates capture when function enabled and i/p set to DIO
76	Hold	This command updates the HOLD register with the present force.
77	Reset Peak Values	
78	Clear all Capture Data	
100	* Enter Remote Set-up	This command is used to be able to change the set-up of the INDI-ISO376 from remote.
101	* Enter Remote Restore	This command is used to be able to restore a saved set-up to the INDI-ISO376 from remote.
102	* Exit Remote Set-up/ Restore and save changes	This is used when the parameters are changed from remote and should be saved in the INDI-ISO376.
103	* Exit Set-up without saving changes	This can be used to discard edits made to the set-up parameters, before the set-up is left.
104	* Do Reset	This command is used to reset the instrument from remote location.
105	Check set-up data	This command checks that the set-up is correct.

* WARNING! This command will interrupt the normal weighing function.

6.5.17. Setpoint 1, setpoint 2

The registers are used to read and write setpoints. See description of setpoint function.

6.5.18. Additional input status

Bits set to 1 in this register have the following meaning:

Bit no	Function	Bit no	Function
0	Digital input 11 activated.	8	Digital input 21 activated.
1	Digital input 12 activated.	9	Digital input 22 activated.
2	Digital input 13 activated.	10	Digital input 23 activated.
3	Digital input 14 activated.	11	Digital input 24 activated.
4	Digital input 15 activated.	12	Digital input 25 activated.
5	Digital input 16 activated.	13	Digital input 26 activated.

- | | | | |
|---|-----------------------------|----|-----------------------------|
| 6 | Digital input 17 activated. | 14 | Digital input 27 activated. |
| 7 | Digital input 18 activated. | 15 | Digital input 28 activated. |

Note: If this register (bits) is read as float value, see description of Data representation.

6.5.19. Additional output status

Bits set to 1 in this register have the following meaning:

Bit no	Function	Bit no	Function
0	Digital output 11 activated.	8	Digital output 21 activated.
1	Digital output 12 activated.	9	Digital output 22 activated.
2	Digital output 13 activated.	10	Digital output 23 activated.
3	Digital output 14 activated.	11	Digital output 24 activated.
4	Digital output 15 activated.	12	Digital output 25 activated.
5	Digital output 16 activated.	13	Digital output 26 activated.
6	Digital output 17 activated.	14	Digital output 27 activated.
7	Digital output 18 activated.	15	Digital output 28 activated.

Note: If this register (bits) is read as float value, see description of Data representation.

6.5.20. Level status

Bits set to 1 in this register have the following meaning:

Bit no	Function	Comment
0	Above level 1	The force is above Level 1.
1	Above level 2	The force is above Level 2.
2	Above level 3	The force is above Level 3.
3	Above level 4	The force is above Level 4.
4	Above level 5	The force is above Level 5.
5	Above level 6	The force is above Level 6.
6	Above level 7	The force is above Level 7.
7	Above level 8	The force is above Level 8.

Note: If this register (bits) is read as float value, see description of Data representation.

6.5.21. Clock

These registers are used to read and write the time and date in INDI-ISO376.

6.5.22. Level 1 ... Level 8

These registers are used to read and write levels that are supervised by INDI-ISO376.

6.5.23. Setpoint 1, setpoint 2

The registers are used to read and write setpoints. See description of setpoint function.

6.6. Set-up register description

Useful if you are writing your own set-up program.

Data type:	Data type:	Description	R/W
Float (2 reg./value)	Modicon float (2 reg./value)		



40368	45368	Not stored calibration points during deadforce calibration. Bit 0 indicates point 1 not stored, bit 1 point 2 and so on...	R
40370	45370	Program options enabled Bit 0 - Batching, Bit 1 - Flow rate, Bit 2 - Option 3 Bit 8 - Option 9.	R
40372	45372	NOT USED	R
40374	45374	NOT USED.	R
40376	45376	Location of first string set-up register. All strings occupies 6 Modbus registers.	R
40378	45378	Number of string set-ups.	R
40380	45380	Location of first normal set-up register. (normally 41000). If 'Modicon float' is used, add 5000 to this value.	R
40382	45382	Number of normal set-ups.	R
40384	45384	Location of first FTS specific application programme specific set-up register. If 'Modicon float' is used, add 5000 to this value.	R
40386	45386	Number of application specific set-ups (normally 0).	R
40394	45394	Set-up version.	R
40396	45396	Set-up data version.	R
41000 –	46000 –	Set-up registers. Registers containing the set-up parameters. See section 3 and 8.	R/W *
41399	46399		
41400 –	46400 –	Batching parameter registers. Registers containing the batching parameters. See section 7.	R/W
41799	46799		

* Only possible to write in 'Remote set-up' state!

Data type: Strings	Description	R/W
44600 – 44690	String set-ups (12 characters / 6 registers each).	R/W

How to edit set-up registers

Example: Change resolution to 0.2.

- Start by setting coil 100 (or command 100) 'Enter Remote Set-up'.
- Locate the resolution parameter in section 3. This gives modbus register 41030.
- Set resolution '0.2' by sending '7' to modbus register 41030.
- Proceed with changes of all the parameters that are to be changed.
- Finish by setting coil 102 (or command 102) 'Exit Remote Set-up/Restore and save changes'.

INDI-ISO376 makes a reset and the changes goes in action.

See section 3 and other parts describing the set-up for more information.

6.7. I/O bits (Coils)

INDI-ISO376 has a number of I/O bits that the master can write to using Modbus function 05 or 15.

Each of these I/O bits are linked to a command in INDI-ISO376, which is described previously in this manual.

Set the I/O bit with the same number as the command that should be executed.

The action is activated if the master sets the I/O bit to 'ON'.

If the master sets the I/O bit to 'OFF', this is accepted, but no action is activated.

All I/O bits are WRITE ONLY. That means the master cannot read the I/O bits but only write to them.

Note: If the master tries to write to more than one I/O bit (Modbus function 15) the INDI-ISO376 will act on the lowest I/O bit number only.

6.8. Data representation

Data sent to and from the INDI-ISO376 uses 16 bit holding registers (40XXX) and can use different formats for flexibility.

Integer

Unsigned integer (1 modbus register)

Values stored in one modbus register as an unsigned integer (16 bit number without decimals).

Scaled integer (2 modbus registers + 1 modbus register = 3 modbus registers)

Values stored in a special 3 register format. The first two registers are used as a 32 bit long integer value (with sign) and the third register is holding the number of decimals in the value.

Example: 12345678 (32 bit number) in the two first registers and 3 in the third register gives the value: 12345.678.

Register	Hex	Decimal	Description
1	00BC	188	The 16 most significant bits in the value.
2	614E	24910	The 16 least significant bits in the value.
3	0003	3	The number of decimals.

Calculations in decimal numbers:

First multiply the most significant register with 216 (65536) and add the least significant register to the value.

$$188 * 216 + 24910 = 12345678$$

Now divide the number to get the right number of decimals. The decimal register was set to 3 in this example, which gives the value 1000 = 1000 to divide with.

$$12345678 / 1000 = 12345.678$$

Note: If your PLC system can't handle 32 bit values, the second register can be used as a 16 bit register with the number of decimals that is indicated in the third register. This will limit the value range to -32768 to +32767. This must be regarded in the calibration of the instrument. Flags in Status register 1 indicates when the forces are bigger than a 16 bit integer. These flags can be checked to be sure that the force fits in just one register.

Float, Modicon float

Values stored as standard IEEE 32 bit float values. Each value has two registers assigned to it. To read/write a float value an even number of Modbus registers, starting at an even address, must be read/written each time.

The float values are stored in two different register orders. Some devices may transfer the values with the high order bits in the first register and the low order bits in the second register. Other devices may invert the register order.

Modicon float: For true Modicon PLC's, use these registers.

Float: Many third party controllers that support Modicon protocol use the float format where all bytes are written out in order to one 32 bit register, as opposed to Modicon float which uses 2 consecutive 16 bit registers. Use these registers for these types of controllers.

When float registers representing bits are read, the bits set are returned as a float value.

For example if bit 4 is set the value 16.0 is returned as a float value, and if both bit 0 and bit 4 are set the value 17.0 is returned as a float value. To use the value it's a good choice to convert it to an unsigned integer where the bits can be compared.

Strings

Each modbus register holds two 8 bit ASCII characters. Each string consists of 12 characters.

Writing strings:

- Must start writing on a valid string start address.
- All data in the string (1 - 6 registers) must be written in one command.
- Unused characters up to position 12 will automatically be filled with spaces.

Reading strings:

- Start reading at any position in the string.
- No null character is added at the end.
- Not used characters are returned as spaces.

Example: Instrument name (SENSY): 44696

Register	Hex	Decimal	Description
44696	4E 4F	20047	NO
44697	42 45	16965	BE
44698	4C 20	19488	L

6.9. Exception responses

When the master sends a query to a slave it expects a normal response (as described earlier). One of the following three events occur after a query from the master.

1. Normal response.

The slave has received the query without communication error and can handle the query normally. The slave returns a normal response.

2. Communication error.

If the slave does not receive the query due to a communication error, or detects some communication error (parity error or checksum error), no response is returned. The master should process a time-out for the query.

3. Command error.

If the slave receives the query without any communication error, but cannot handle the query, e.g. if the command was not valid, the requested register number not valid or INDI-ISO376 in a mode where the command was not allowed, then the slave will return an exception response informing the master of the nature of the error.

The following exception codes are possible.

Code	Name	Description
01	Illegal function	Not a valid function code. Valid function codes are 01, 02, 03, 05, 06, 08, 15, 16.
02	Illegal data address	Not a valid data address. See 'Register description' for a list of allowed registers.
03	Illegal data value	Value in data query field not valid. To get a better explanation of the error, the 'command error' register could be read.
07	Negative acknowledgement	INDI-ISO376 has received the query but cannot perform it. To get a better explanation of the error, the 'command error' register could be read.

6.10. Supported Modbus functions

Function	Description
01 Read Coil Status	Reads the state of discrete outputs (0X references, coils). Only implemented because some 'masters' use this function to initiate communication. Coil range: 1 – 16 (Max number of points to read: 16). Response: Zero (OFF) for all requested points.
02 Read Input Status	Reads the state of discrete inputs (1X references). This function is implemented only because some 'masters' use this function to initiate communication. Input range: 1 – 16 (Max number of points to read: 16). Response: Zero (OFF) for all requested points.
03 Read Holding Reg.	Reads the binary contents of holding registers (4X references). Max number of registers to read: 100
05 Force Single Coil	Forces a single coil (0X references) to either ON or OFF. This function is used to activate commands in INDI-ISO376.
06 Preset Single Reg.	Presets a value into a single holding register (4X references).
08 Diagnostics	This function can provide a series of different communication tests, depending on a sub function code. INDI-ISO376 supports only sub function code 00, which is a 'loop-back' test. The same data as received will be sent back to the master. Max number of data bytes: 64
15 Force Multiple Coils	Forces each coil (0X references) in a sequence of coils to either ON or OFF. This function is used to activate commands in INDI-ISO376. Max. number of points: 16 (only the first is used).
16 Preset Multiple reg.	Presets values into a sequence of holding registers (4X references). Max number of registers to preset: 100

Note: No broadcast messages are allowed.

It is possible to send or fetch any number of registers (max 100) or I/O bits (max. 16). If the master tries to read more registers than there are available, the INDI-ISO376 module will send dummy values for those registers not available.

6.11. External display

6.11.1. General

The transmitted value is adapted for Newport/London external displays with 4, 5, 6 or 7 digits and the Intrinsic safety indicator MTL 643 with 32 characters.

6.11.2. Setup of external display

COMx: Mode:	Ext. display.
COMx: Baudrate:	As selected on external display.
COMx: Data format:	As selected on external display.
Ext. disp. mode:	The wanted presentation on the external display. (Absolute force, Relative force or Displayed force.)
Ext. disp. format:	Depending on type of external display as described in the following tables.

Type	Description
4 (digits)	Four digit indicator. Display: -999 – 9999 (plus decimal point).
5 (digits)	Five digit indicator. Display: -9999 – 99999 (plus decimal point).

Type	Description
6 (digits)	Six digit indicator. Display: -99999 – 999999 (plus decimal point). Possible absolute/relative indicators will be activated.
7 (digits)	Seven digit indicator. Display: -999999 – 9999999 (plus decimal point).
32 (char.)	MTL 643 indicator. Display: -999999 – 9999999 (plus decimal point).

6.11.3. External display with 4 to 7 digits

The external display normally shows the current force, but under the following conditions only 'dashes' (-----) are displayed:

- the number of digits in the transmitted force value is outside the display range.
- the instrument is not in normal state or there is a force error.

Definition of force/flow value to external display with 4, 5, and 7 digits:

Character No.	Value alphanumeric.	Value Hex	Function
1		02	Start character (STX).
2 to 5 – 9	0 – 9, ., -	30 – 39, 2E, 2D	*/ Force value: 4, 5 or 7 digits and a possible decimal point. (The first digit may be a minus sign).
Last		0D	End character (CR).

Definition of force/flow value to external display with 6 digits:

Character No.	Value alphanumeric.	Value Hex	Function
1		02	Start character (STX).
2	H, M, blank	48, 4D, 20	This character is present only if 6 digits is selected in 'Ext. disp.format'. H = absolute force is transmitted. M = relative force is transmitted. blank = flow, or no valid force is transmitted.
3 to 8 – 9	0 – 9, ., -	30 – 39, 2E, 2D	*/ Force value: 6 digits and a possible decimal point. (The first digit may be a minus sign).
Last		0D	End character (CR).

Note: */ The number of digits in the value (including a minus sign, if present) will equal the number of digits selected in 'Ext. disp.format'. Leading zeros will be added to fill up to the selected number of digits. The decimal point does not occupy any digit position.

6.12. Printing

The print function is designed to work best with a 40 characters printer.

6.12.1. Printout types

The following types of printout can be obtained:

- Printout of displayed force.
- Printout of stored print values.
- Printout of Capture values.
- Printout of level and setpoint values.
- Printout of set-up list.

6.12.2. Setup of printer

COMx: Mode: Printer or Printer 850

Printer: ASCII characters (1-127 dec.) with international character codes described in the table below.

Printer 850: Multilingual character set known as Code Page 850 (1-255 dec.)

Printers are using different character codes for the international characters found in the Swedish, German and French language. Depending on whether 'Printer' or 'Printer 850' is chosen and depending on the chosen language in the instrument, different character codes are used.

When 'Printer' is chosen, the printer should be set to the same language as the language used in INDI-ISO376 if possible.

Table showing character codes used for different settings of 'COMX Mode' and 'Language' in INDI-ISO376. All numbers stated in decimal representation

Character in INDI-ISO376	Mode: Printer Language: Sve./Eng./Suo.	Mode: Printer Language: Deut./Ned.	Mode: Printer Language: Fra./Esp.	Mode: Printer 850
å	125 (j)	97 (a)	97 (a)	134
ä	123 (i)	123 (i)	97 (a)	132
ö	124 (l)	124 (l)	111 (o)	148
ü	126 (~)	125 (j)	117 (u)	129
Å	93 (I)	65 (A)	65 (A)	143
Ä	91 (I)	91 (I)	65 (A)	142
Ö	92 (l)	92 (l)	79 (O)	153
Ü	85 (U)	93 (I)	85 (U)	154
ô	111 (o)	111 (o)	111 (o)	147
ç	99 (c)	99 (c)	92 (l)	135
Ç	99 (c)	99 (c)	92 (l)	128
à	97 (a)	97 (a)	97 (a)	133
è	101 (e)	101 (e)	125 (j)	138
é	96 (')	101 (e)	123 (i)	130
ê	101 (e)	101 (e)	96 (')	136
ß	115 (s)	126 (~)	115 (s)	225

COMx:Baudrate: As selected on the printer.

COMx:Data format: As selected on the printer.

Printer pos 1 – 4: For flexibility it's possible to select the use of four different printer fields with the size of 20 characters each. The fields can be either: 'Not in use', 'Disp.force', 'Date/Time', 'Instr.name' or 'HOLD value'. This layout is only used when the displayed force is printed, using the 'PRINT' button.

Printer pos.1

Printer pos.2

Printer pos.3

Printer pos.4

The layout of the printer fields.

If both positions on a row are set to 'Not in use' that row is omitted.

Printer linefeed: After each printout of displayed force, ordered with the 'PRINT' button, the amount of linefeeds defined in this parameter is added.

6.12.3. Print examples

Printout of displayed force/flow rate (Print button pressed)

Printer pos.1 = Date/Time

Printer pos.2 = Instr. name

Printer pos.3 = Not in use

Printer pos.4 = Disp. force

Printer linefeed = 0

Instrument name = CellForce

```

1999-01-01 02:45      CellForce
                      Rel    1.22200 mV/v
1999-01-01 02:46      CellForce
                      Abs    0.67878 mV/V
    
```

(relative force is displayed)

(absolute force is displayed)

Printout of used levels and setpoints

```

-----
1999-01-01 02:49      CellForce
Level 1                0.50000 mV/V
Level 2                0.80000 mV/V
Level 3                1.50000 mV/V
Setpoint 1            2.50000 mV/V
-----
    
```

Printout of set-up list

```

-----
1999-01-01 02:47      CellForce
FTS 3 (T510A220)      99-1001

Language              English
Start mode            Auto
Display info          Date/Time
Display contrast      4
Backlight             5
Date format           YYYY-MM-DD
Absolute/relative key On
Tare key              On
Print key             On
Zero key              On
.....
    
```

Printout of capture values

STORED PRINT:	
11:33	1.02345 mV/V
11:36	2.02565 mV/V
11:39	1.08945 mV/V

Printout of stored print values

CAPTURE VALUES:	
1:	1.02345 mV/V
2:	1.02565 mV/V
3:	1.08945 mV/V
▼	
10:	1.08955 mV/V

7. TROUBLESHOOTING

7.1. General

During installation or maintenance of the INDI-ISO376 instrument, sub menu Diagnostics in menu 'Edit set-up' may be useful for solving possible problems, especially when external units are involved.

INDI-ISO376 has an automatic error checking facility. This serves to facilitate troubleshooting and to ensure that the instrument will function in the best possible manner. When an error is detected, the measuring functions are interrupted, all outputs are set passive, the analogue outputs are set to 0 V or 0 mA, and an error code will be displayed.

7.2. Diagnostics

Menu 'Diagnostics' is useful by troubleshooting, to check instrument functions and connections between INDI-ISO376 and external units. Digital input status can be read, digital and analogue output status can be set, and the instrument calibration can be checked.

As 'Diagnostics' is used, menu 'Edit set-up' is open so normal measuring functions are interrupted.

In menu 'Diagnostics' the cursor can be positioned at a sub menu name. When ENTER is pressed that sub menu will be opened.

INDI-ISO376 displays the weight value

1.0678mV/V Rel			
1998-10-18 11:18			
DISPLAY			

i 0 → 'Operator code' may be needed!

Main menu ↓			
▶ Instrument name			
Capture			
Edit levels			
BACK	UP	DOWN	ENTER

i 0 → 'Set-up code' may be needed!

WARNING!			
The measurement function will be interrupted			
Are you sure to continue?			
		YES	NO

YES ↓ → DOWN ↓ x11 →

Edit set-up ↓			
Program options			
Legal lock			
▶ Diagnostics			
EXIT	UP	DOWN	ENTER

ENTER →

Diagnostics ↑			
▶ Read digital inputs			
Control digital outputs			
Control analogue outputs			
BACK	UP	DOWN	ENTER

Read digital inputs

In this menu the status of all digital inputs to INDI-ISO376, internally or by additional I/O units, can be monitored. Status for the digital inputs can not be changed in this menu.

Position the cursor at sub menu name 'Read digital inputs' and press ENTER.

ENTER →

Read digital inputs							
01:P	02:P	11:-	12:-	13:-	14:-	15:-	16:-
17:-	18:-	21:-	22:-	23:-	24:-	25:-	26:-
27:-	28:-						
BACK							

01 and 02 are internal inputs to INDI-ISO376, 11 - 18 are inputs through additional unit I/O 1, 21 - 28 are inputs through additional unit I/O 2.

Inputs that are not available (or not existing) are marked minus (-). Available inputs are marked 'A' when active, marked 'P' when passive.

Control digital outputs

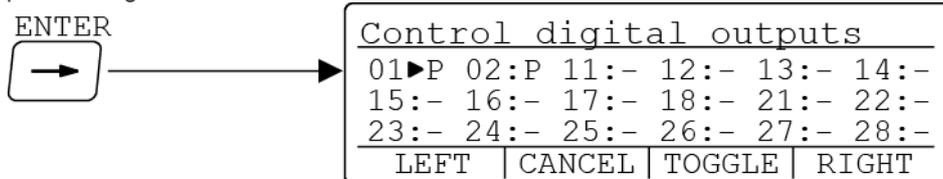
In this menu the status of all digital (relay) outputs from INDI-ISO376, internally or by additional I/O units, can be monitored and edited.

Position the cursor at sub menu name 'Control digital outputs' and press ENTER.

01 and 02 are internal outputs from INDI-ISO376,

11 - 18 are outputs through additional unit I/O 1,

21 - 28 are outputs through additional unit I/O 2.



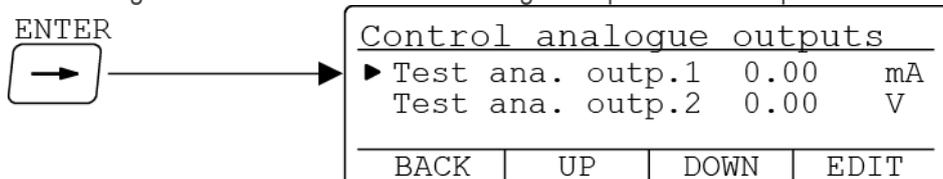
Outputs that are not available (or not existing) are marked minus (-). Available outputs are marked 'A' (active) or 'P' (passive).

Initially all outputs are marked '-' or 'P' because all available outputs are set passive when 'Edit set-up' is opened and the normal measuring functions are interrupted.

Position the cursor at an available output, marked A or P. When TOGGLE is pressed, the output will change status.

Control analogue outputs.

Position the cursor at Diagnostics sub menu 'Control analogue outputs' and then press ENTER.



This menu can be opened, provided at least one of the parameters 'Output source' in menu Analogue outputs is set to something else than 'Not in use'.

If the 'Test ana.' value for an output is replaced by '-----', it means that the analogue output unit is not available and the value cannot be edited.

When 'Diagnostics' is used normal measuring functions for INDI-ISO376 are interrupted and the analogue outputs are set to zero, so initially the value for the available outputs will be 0.00 (mA or V).

To change the output signal, position the cursor at the wanted line, and press EDIT. The cursor moves to the signal value for the analogue output, replaced by an underscore line where a new value can be entered by the digit keys.

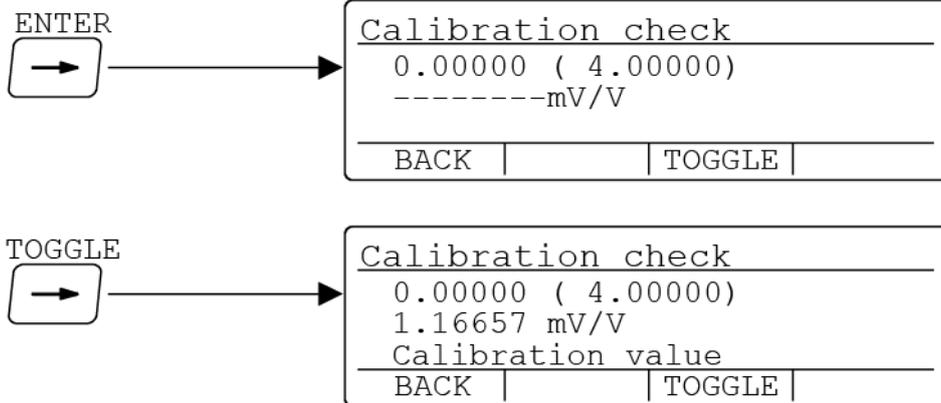
7.2.1. Calibration check

This function connects an internal calibration resistor to the transducers, provided that terminals 7 and 8 are interconnected. A calibration value will be shown that is equal to the maximum mV/V reading possible (4 or 7 mV/V).

Operation

Calibration check should be done whenever you suspect a malfunction or at least once a year

Position the cursor at Diagnostics sub menu 'Calibration check', and then press ENTER.



The menu 'Calibration check' is opened, showing actual Absolute mv/v and, in brackets, the FTS maximum capacity.

Press TOGGLE to perform a calibration check, i.e. the internal shunt resistor is connected to the transducer (provided that terminals 7 and 8 are interconnected).

The calibration value should be noted for each load cell connected and used as a reference in the future.

7.3. Error codes

When an error is detected, or when menu 'Edit set-up' is opened, all digital outputs are set passive and the analogue outputs are set to 0 V or 0 mA. This part provides a guidance on how to deal with the fault or error.

Some errors are displayed on INDI-ISO376, containing a description of the error and the error code. The error codes can also be fetched by Modbus communication in the registers 'Instrument error' and 'Command error' (see section 6. Communication). The error codes are divided in four groups, depending on their origin:

- Force errors, occur when transducer signals or force values go out of given ranges.
- Start-up errors, occur only during start-up.
- General errors, usually occur due to faulty entries from the front panel, alternatively invalid data or commands from the control unit.
- Set-up errors, can only occur during instrument set-up (from the front panel or by serial communication).

On the following pages a summary of all error codes is given (note that code 000 always means 'no error').

7.3.1. Force errors

The indication is either temporary or stays on until the cause is cured.

Error code	Explanation
000	No error.
	The instrument in 'normal state' and no error is detected.
001	Instrument in Remote set-up state.
	Force is not valid.
003	Instrument not in normal state.
	Force is not valid.
004	Overload
	Overload means that the force exceeds the highest allowed limit that is specified in the set-up parameters 'Overload check' and 'Overload limit'.

Error code	Explanation
005	Over range Over-range means that the input signal from the transducer exceeds the operating range.
006	Under-load Under-load means that the force is below the lowest allowed limit that is specified in the set-up parameters 'Overload check' and 'Overload limit'.
007	Under-range Under-range means that the input signal from the transducer is below the operation range.
010	Excitation short-circuit. " Check transducer connections " Either a short-circuit in the excitation circuit or too many transducers connected. (A fault in a transducer or inside the instrument is also possible.) Check transducer connections. See section, 2 Installation.
011	Sense voltage error. " Check transducer connections " The sense voltage is too low, unbalanced or has a reversed polarity. (A fault in a transducer or inside the instrument, is also possible.) Check transducer connections. See section, 2 Installation.
012	Transducer signal error The input signal is too high, for example due to a faulty or missing transducer connection. (A fault in a transducer or inside the instrument is also possible.) Check transducer connections. See section, 2 Installation.
013	Transducer signal out of range The input signal is too high. (A fault in accordance with Error 012 above is also possible.)
014	Invalid AD signal Invalid AD signal is reported whilst the instrument is waiting for sufficient conversion data to calculate a valid force value. This indication is reported during power-up and while switching the shunt calibration resistor to and from, since the conversion will be momentarily unreliable.
015	Transducer sign. out of range The input signal is too low. (A fault in accordance with Error 012 above is also possible.)
019	Calibration resistor connected The absolute and relative force registers contain the calibration value, see Calibration check.

7.3.2. Start-up errors

These error codes can only appear during start-up.

Error code	Explanation
080	Invalid set-up version. This error usually occurs at first start-up after a program upgrade. The actual settings have been replaced by default values. Enter set-up mode, perform the necessary editing and save the new parameter settings.
081	Invalid set-up data. Indicates faulty set-up checksum. The actual settings have been replaced by default values. Enter set-up mode, perform the necessary editing and save the new parameter settings.

Error code	Explanation
082	Invalid force data. This error code can occur at restart after a power failure, etc. It indicates one or several faults among the stored data for auto tare, zero setting and absolute/relative mode. It also indicates that the instrument is using default values (0 for auto tare and zero setting and absolute/relative is set to absolute). The operator must send a reset command from the control computer or power off and on the instrument to achieve normal operation.
083-085	Invalid factory calibration. Invalid factory calibration is a fatal error. It indicates that the range constant stored in the EEPROM during manufacture has been corrupted. A specially trained service personnel is required. The distributor must be contacted.
086	Parameters error. Indicates faulty parameter checksum. The actual settings have been replaced by default values. Enter set-up mode, perform the necessary editing and save the new parameter settings.
097	RAM error. RAM memory error is a fatal error. It indicates equipment failure which requires trained service personnel. The distributor must be contacted.
098	FLASH error. Flash memory error is a fatal error. It indicates equipment failure which requires trained service personnel. The distributor must be contacted.
099	Watchdog error. If a watchdog error appears the system will be reinitialised. The operator must then send a reset command from the control computer, or power the instrument off and on, to achieve normal operation. The program regularly sends impulses to a special watchdog circuit to ensure that the circuits and the program operate correctly. However, if these impulses for any reason are omitted the watchdog error indication will result.

7.3.3. General errors

These errors generally occur due to faulty entries from the front panel, alternatively invalid data or commands from the control unit.

Error code	Explanation
100	Instrument in wrong state. The transmitted command is not applicable to the present INDI-ISO376 mode.
101	Over-range entry. Value over allowed range. Compare with restrictions for the parameter.
102	Under-range entry. Value under allowed range. Compare with restrictions for the parameter.
103	Illegal start address. Illegal modbus start address, when writing data to INDI-ISO376.
104	Illegal number of registers. Illegal number of modbus registers, when writing data to INDI-ISO376.
105	Illegal value error. Illegal data in modbus registers, when writing data to INDI-ISO376.
106	Choice not available. The choice is not valid in this program release of the INDI-ISO376 software.

Error code	Explanation
120	Unstable force. Zero setting always requires a stable force. If motion check is set to ON, also relative zeroing and printing of force values requires a stable force on the instrument. Consequently, if you try to transmit a command for zero setting, relative zeroing, or printing of force value without awaiting a stable force you will receive this error code.
121	Relative zeroing not allowed (negative absolute force). Relative zeroing is not allowed at negative absolute force if parameter 'Overload check' is set to Unipolar.
122	Instrument in relative mode. Zero setting requires that the instrument is in absolute mode. However, if you try to transmit a zero setting command while the FTS is in relative mode you will receive this error code.
123	N/A
124	Setpoint(s) not in use. Activation/Deactivation of setpoint(s) cannot be done, as at least one of the setpoint sources is/are set to 'not in use'.
125	N/A
126	Relative mode not allowed. Relative force cannot be shown when the tare value equals 0.
127	Remote operation not allowed. The enter remote operation command is only allowed when INDI-ISO376 is displaying force.
130	Enter set-up/restore not allowed. The transmitted command is not applicable to the present INDI-ISO376 mode.
132	Wrong port for software upgrade. Software upgrade is only possible via Com 1.
133	Function not allowed when legal lock is on. Software upgrade, default set-up and restore set-up is not allowed when the legal lock is set to On.
134	Option not enabled. The command cannot be executed, as the needed Program option is not enabled.
135	N/A.
136	N/A
137	N/A.
138	Printer not ready. The printer cannot be handled as the buffer is full.
139	No printer configured. Printout cannot be performed as no printer is configured on any of the serial ports.
140	Command not allowed at the moment. The requested command is not allowed at the moment.

7.3.4. Set-up errors

These errors occur only during instrument set-up, from the front panel or by serial communication. Certain errors depends on more than one set-up parameter and it is the operator's responsibility to locate and correct all faulty set-up parameters.

Error code	Explanation
160	Calibration force error. Force error during calibration.
161	Parameter locked by legal lock. The instrument is sealed by a legal lock, and the parameter you have tried to change is locked.
162	Timeout when storing cal.point! Transducer signal is not stable within 10 seconds by storing of the calibration point.

Error code	Explanation
163	Saving of set-up value not allowed. Certain set-up parameters are dependent on other parameters and saved automatically when you save a new value for the related set-up. Thereafter, certain automatically saved parameters can only be browsed. If you try to save a new value in one of these set-ups this indication will result.
164	Illegal set-up register. Requested set-up parameter does not exist or is not defined.
165	Capacity/Resolution > 6 digits! The Capacity value has more than the permitted 6 digits. Select a combination of Resolution and Capacity that will result in max. 6 digits plus decimal point.
166	Some parameters set to default. Some parameters that were restored uses special choices that are not allowed in this instrument. These parameters will be set to default.
167	Illegal calibration direction! All forces with corresponding mV/V values must be increasing for increasing calibration point number.
168	Warning - Calibration not finished! (All cal. points not stored). A deadforce calibration was started, but all calibration points are not stored.
169	N/A
170	N/A.
171 – 176	Input/Output used in activity [1–6] not defined as B. activity. An input/output used in the batching activity 1–6 is not set to B. activity in the input/output menu.
177	N/A
187	N/A
188	Capacity/Resolution > 6 digits! Exit set-up/restore not allowed. The Capacity value has more than the permitted 6 digits. Select a combination of Resolution and Capacity that will result in max. 6 digits plus decimal point.
189	Too high transd. signal in cal. point 2. Exit set-up/restore not allowed, the mV/V signal in calibration point 2 is too high (often due to a previous, strange data sheet calibration).
190	Too high transd. signal in cal. point 2. Exit set-up/restore not allowed, the mV/V signal in calibration point 2 is too high, due to strange data sheet calibration. The conversion factor, rated load etc. does not correspond to each other.
191	Illegal calibration direction. All forces with corresponding mV/V values must be increasing for increasing calibration point number.
193 – 198	Input/Output used in activity [1–6] not defined as B. activity Exit set-up/restore not allowed, an input/output used in the batching activity 1–6 is not set to B. activity in the input/output menu.
199	COM3 and COM4 on the same unit. COM3 and COM4 must be on separate I/O units.

Error code	Explanation
41000 –	Exit Remote Set-up/Restore not allowed.
41798	There is an error in the parameter pointed out by this error code. The parameter value is out of range.



APPENDIX

Set-up list for INDI-ISO376

Address:

Location/Notes:

Progr. name: Ser. no.: Date:

Modbus number	Parameter name	Default value	Set-up value
41000 (46000)	Language	English [1]	.....
41002 (46002)	Start mode	Auto [1]	.....
41004 (46004)	Display contrast	4 [4]	.....
41006 (46006)	Backlight	5 [5]	.....
41008 (46008)	Date format	YYYY-MM-DD[0]	.....
41010 (46010)	Abs/rel key	On [1]	.....
41012 (46012)	Rel zero key	On [1]	.....
41014 (46014)	Print key	On [1]	.....
41016 (46016)	Operator lock	Off [0]	.....
41018 (46018)	Operator code	1937	.....
41020 (46020)	Set-up lock	Off [0]	.....
41022 (46022)	Set-up code	1937	.....
41024 (46024)	Meas. unit	mV/V [2]	.....
41026 (46026)	Resolution	0.00001 [0]	.....
41028 (46028)	Capacity	4.00000	.....
41030 (46030)	Mains frequency	50 Hz [0]	.....
41032 (46032)	Filter type	Standard [1]	.....
41034 (46034)	Filter time	800	.....
41036 (46036)	Filter window	10 * Resolution	.....
41038 (46038)	Motion detect w.	1 * Resolution	.....
41040 (46040)	No-motion delay	1.0	.....
41042 (46042)	Motion check	Off [0]	.....
41044 (46044)	Warm up time	0	.....
41046 (46046)	Overload check	Off [0]	.....
41048 (46048)	Overload limit	Cap. + 9 * Res.	.....
41050 (46050)	Excitation	DC [0]	.....
41052 (46052)	Type of Cal	TABLE	TABLE
41054 (46054)	Number of cal.p	6	.....
41056 (46056)	Value cal. p.1	0.00000	.....
41058 (46058)	Value cal. p.2	1.00000	.....
41060 (46060)	Value cal. p.3	1.50000	.....
41062 (46062)	Value cal. p.4	2.00000	.....
41064 (46064)	Value cal. p.5	3.00000	.....
41066 (46066)	Value cal. p.6	3.30000	.....
41068 (46068)	Transd.sign. p.1	0.00000	.....
41070 (46070)	Transd.sign. p.2	1.00000	.....
41072 (46072)	Transd.sign. p.3	1.50000	.....
41074 (46074)	Transd.sign. p.4	2.00000
41076 (46076)	Transd.sign. p.5	3.00000
41078 (46078)	Transd.sign. p.6	3.30000



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Modbus number	Parameter name	Default value	Set-up value
41080 (46080)	Instrum. address	1
41082 (46082)	COM1:Mode	Modbus auto [2]	.....
41084 (46084)	COM1:Baudrate	9600 [5]	.....
41086 (46086)	COM1:Data format	8-none-1 [5]	.....
41088 (46088)	COM2:Mode	I/O bus [7]	.....
41090 (46090)	COM2:Baudrate	115200 [9]	.....
41092 (46092)	COM2:Data format	8-none-1 [5]	.....
41094 (46094)	COM3:Mode	Not in use [0]	.....
41096 (46096)	COM3:Baudrate	9600 [5]	.....
41098 (46098)	COM3:Data format	8-none-1 [5]	.....
41100 (46100)	COM3:Position	Dig.I/O 1 [2]	.....
41102 (46102)	COM4:Mode	Not in use [0]	.....
41104 (46104)	COM4:Baudrate	9600 [5]	.....
41106 (46106)	COM4:Data format	8-none-1 [5]	.....
41108 (46108)	COM4:Position	Dig.I/O 2 [3]	.....
41110 (46110)	Ext. disp.mode	Absolute force [0]	.....
41112 (46112)	Ext. disp.format	6 [2]	.....
41114 (46114)	Printer pos.1	Disp force [1]	.....
41116 (46116)	Printer pos.2	Not in use [0]	.....
41118 (46118)	Printer pos.3	Not in use [0]	.....
41120 (46120)	Printer pos.4	Not in use [0]	.....
41122 (46122)	Printer linefeed	0 [0]	.....
41124 (46124)	Level 1 source	Not in use [0]	.....
41126 (46126)	Level 1 outp.	Active above [0]	.....
41128 (46128)	Level 1 hyst.	0.2	.....
41130 (46130)	Level 2 source	Not in use [0]	.....
41132 (46132)	Level 2 outp.	Active above [0]	.....
41134 (46134)	Level 2 hyst.	0.2	.....
41136 (46136)	Level 3 source	Not in use [0]	.....
41138 (46138)	Level 3 outp.	Active above [0]	.....
41140 (46140)	Level 3 hyst.	0.2	.....
41142 (46142)	Level 4 source	Not in use [0]	.....
41144 (46144)	Level 4 outp.	Active above [0]	.....
41146 (46146)	Level 4 hyst.	0.2	.....
41148 (46148)	Level 5 source	Not in use [0]	.....
41150 (46150)	Level 5 outp.	Active above [0]	.....
41152 (46152)	Level 5 hyst.	0.2	.....
41154 (46154)	Level 6 source	Not in use [0]	.....
41156 (46156)	Level 6 outp.	Active above [0]	.....
41158 (46158)	Level 6 hyst.	0.2	.....
41160 (46160)	Level 7 source	Not in use [0]	.....
41162 (46162)	Level 7 outp.	Active above [0]	.....
41164 (46164)	Level 7 hyst.	0.2	.....
41166 (46166)	Level 8 source	Not in use [0]	.....
41168 (46168)	Level 8 outp.	Active above [0]	.....
41170 (46170)	Level 8 hyst.	0.2	.....



Modbus number	Parameter name	Default value	Set-up value
41172 (46172)	Setp.1 source	Not in use [0]	.....
41174 (46174)	Setp.2 source	Not in use [0]	.....
41176 (46176)	Input 01 use	Not in use [0]	.....
41178 (46178)	Input 02 use	Not in use [0]	.....
41180 (46180)	Input 11 use	Not in use [0]	.....
41182 (46182)	Input 12 use	Not in use [0]	.....
41184 (46184)	Input 13 use	Not in use [0]	.....
41186 (46186)	Input 14 use	Not in use [0]	.....
41188 (46188)	Input 15 use	Not in use [0]	.....
41190 (46190)	Input 16 use	Not in use [0]	.....
41192 (46192)	Input 17 use	Not in use [0]	.....
41194 (46194)	Input 18 use	Not in use [0]	.....
41196 (46196)	Input 21 use	Not in use [0]	.....
41198 (46198)	Input 22 use	Not in use [0]	.....
41200 (46200)	Input 23 use	Not in use [0]	.....
41202 (46202)	Input 24 use	Not in use [0]	.....
41204 (46204)	Input 25 use	Not in use [0]	.....
41206 (46206)	Input 26 use	Not in use [0]	.....
41208 (46208)	Input 27 use	Not in use [0]	.....
41210 (46210)	Input 28 use	Not in use [0]	.....
41212 (46212)	Output 01 use	Not in use [0]	.....
41214 (46214)	Output 02 use	Not in use [0]	.....
41216 (46216)	Output 11 use	Not in use [0]	.....
41218 (46218)	Output 12 use	Not in use [0]	.....
41220 (46220)	Output 13 use	Not in use [0]	.....
41222 (46222)	Output 14 use	Not in use [0]	.....
41224 (46224)	Output 15 use	Not in use [0]	.....
41226 (46226)	Output 16 use	Not in use [0]	.....
41228 (46228)	Output 17 use	Not in use [0]	.....
41230 (46230)	Output 18 use	Not in use [0]	.....
41232 (46232)	Output 21 use	Not in use [0]	.....
41234 (46234)	Output 22 use	Not in use [0]	.....
41236 (46236)	Output 23 use	Not in use [0]	.....
41238 (46238)	Output 24 use	Not in use [0]	.....
41240 (46240)	Output 25 use	Not in use [0]	.....
41242 (46242)	Output 26 use	Not in use [0]	.....
41244 (46244)	Output 27 use	Not in use [0]	.....
41246 (46246)	Output 28 use	Not in use [0]	.....
41248 (46248)	1:Output source	Not in use [0]	.....
41250 (46250)	1:Output type	4-20mA [3]	.....
41252 (46252)	1:Range low	0	.....
41254 (46254)	1:Range high	4.00000	.....
41256 (46256)	1:Low adjust	0	.....
41258 (46258)	1:High adjust	0
41260 (46260)	1:Filter const.	1 [0]
41262 (46262)	2:Output source	Not in use [0]



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Modbus number	Parameter name	Default value	Set-up value	
41264 (46264)	2:Output type	4-20mA [3]
41266 (46266)	2:Range low	0	.....	.....
41268 (46268)	2:Range high	4.00000	.....	.....
41270 (46270)	2:Low adjust	0	.....	.....
41272 (46272)	2:High adjust	0	.....	.....
41274 (46274)	2:Filter const.	1 [0]	.....	.....
40276 (45276)	Stored Print on / off	Off [0]	.....	.....
41278 (46278)	Peak on / off	Off [0]	.....	.....
41280 (46280)	Hold on / off	Off [0]	.....	.....
41282 (46282)	Hold auto P on/off	Off [0]	.....	.....
41284 (46284)	Log on/off	Off [0]	.....	.....
41286 (46286)	Log interval	10	.....	.....
41288 (46288)	Capture on / off	Off [0]	.....	.....
41290 (46290)	No of readings	10	.....	.....
41292 (46292)	Trigger Type	Off [0]	.....	.....

AMMENDMENT TO INDI-ISO376 HANDBOOK

Version T518A211

Addition of BC and EC commands for continuous weight transmission

BC

(Begin. Contin)

BC Start continuous weight transmission

Sends the displayed weight continuously

STX|address|BC|chksum|CR

Message part	Explanation
STX (02 hex)	Start character.
address	Optional instrument address (2 characters, 01 - 99).
BC	Command ID (2 characters).
chksum	Checksum (1 character).
CR (0D hex)	End character.

BC Reply from INDI-ISO376

(Repeated continuously until 'EC' command is received)

STX|address|ack-type|BC|W-msg|.chksum|CR

Message part	Explanation
STX (02 hex)	Start character.
address	Optional instrument address (2 characters, 01 - 99).
ack-type	ack (0) command performed. Or: nak1 (1) error in received message, or nak2 (2) cannot perform command.
BC	Command ID (2 characters).
W-msg.	Weight message. NOTE 1!
chksum	Checksum (1 character).
CR (0D hex)	End character.

Note that the instrument sends a new weight value after every weight conversion (max. 6.25 Hz). This command should therefore not be used at a lower 'Baud rate' than 1200 baud (SU 201).

Acknowledgement conditions:

nak2: The instrument is not in 'normal state' (Initiation after power-up, during set-up or error condition.)

NOTE 1: Weight message:
See definition of weight message in 'WV' command.

EC

(End Contin.)

EC Stop continuous weight transmission

STX|address|EC|chksum|CR

Message part	Explanation
STX (02 hex)	Start character.
address	Optional instrument address (2 characters, 01 - 99).
EC	Command ID (2 characters).
chksum	Checksum (1 character).
CR (0D hex)	End character.

EC Reply from INDI-ISO376

STX|address|ack-type|EC|chksum|CR

Message part	Explanation
STX (02 hex)	Start character.
address	Optional instrument address (2 characters, 01 - 99).
ack-type	ack (0) command performed. Or: nak1 (1) error in received message, or nak2 (2) cannot perform command.
EC	Command ID (2 characters).
chksum	Checksum (1 character).
CR (0D hex)	End character.

Acknowledgement conditions :

nak2 : Normally, a nak2 reply is never sent.