

2023

# MI-140, MI-140S Display Module Operation Manual

PLA150.504.000.000 RE

Ver. 2.02





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# 1. Description and work

## 1.1. MI-140 Description and work

### 1.1.1. MI-140 Purpose

Display modules MI-140 are designed to display the measured technological parameters of SKPB DEL-150, DEL-140 during drilling operations, and well workover in the oil and gas industry.

The list of parameters displayed on the MI-140 indicators:

- the hook load of the lifting mechanism;
  - load on the drilling tool;
  - rotor torque;
  - the value and dynamics of technological pressures;
  - speed of descent, ascent;
  - the position of the hook above the table;
  - bottomhole depth;
  - pipe wrenche torque;
  - pump rpm;
  - mud consumption;
  - mud level;
  - mud volume;
  - mud temperature;
  - ambient temperature;
- and other recorded parameters that require visual inspection.

MI-140 can be applied including in an explosive zone.

### 1.1.2. The list of indicators working in conjunction with the control module DEL-140, DEL-150

Figure 1. Display Module list

Classification number	Device	Work with console	Parameters quantity
<b>Digital Display Modules</b>			
PLA150.504.041.000	MI-140(P1) Display Module		2
PLA150.504.042.000	MI-140(P2) Display Module	+	2
PLA150.504.043.000	MI-140(P3) Display Module	+	3
PLA150.504.044.000	MI-140(PU) Display Module		4
<b>Digital counter-pointer display (with color choice)</b>			
PLA140.504.025.000-01	MI-140S-4E	+	4
PLA140.504.024.000-01	MI-140S (6P)E	+	6
<b>Display Module with electronic parameter's writing</b>			
PLA150.504.045.000	MI-140(P4) Display Module	+	4...8
PLA150.504.046.000	MI-140(P8) Display Module	+	8...14
PLA150.504.047.000	MI-140(P9) Display Module	+	9...16
PLA150.504.048.000	MI-140(P12) Display Module	+	9...18

### 1.1.3. Technical characteristics

MI-140(P1), MI-140(P2), MI-140(P3), MI-140(PU) physical configuration is showed on figures below.

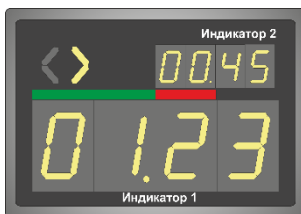


Figure 1. MI-140(P1)

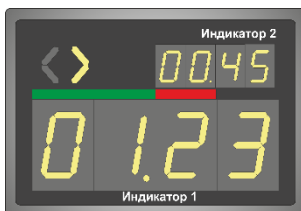


Figure 2. MI-140(P2)

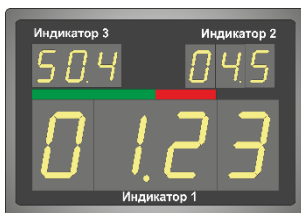


Figure 3. MI-140(P3)

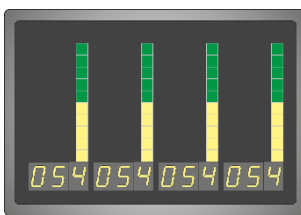


Figure 4. MI-140(PU)

Table 2. MI -140(P1), MI-140(P2), MI-140(P3), MI-140(PU) Short technical characteristics

№ position	Technical characteristics	Value
1	Displayed parameters number	2-4
2	Length of digital data display, symbols	4(3)
3	Operating temperature range, °C	-45 ... +65
4	Ex marking EAC	1ExibIIAT5GbX
5	Ex marking ATEX	II2GExibIIAT5Gb
6	Rated supply voltage, W	12 ... 18
7	Ingress protection IEC 60529-2015	IP 65
8	Power Supply GOST 12.2.007.0-75	III
9	Weather resistance GOST 15150-89	UHL1
10	Cable length, m	100

MI-140(P1), MI-140(P2), MI-140(P3), MI-140(PU) physical configuration is showed on pictures below

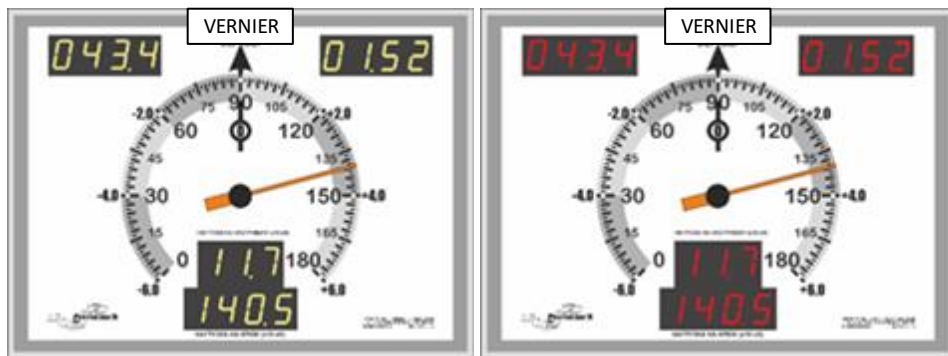


Figure 5. MI-140S-4E



Figure 6. MI-140S (6P)E

Figure 3. MI-140S(4E), MI-140S(6P)E Short technical characteristics

№ position	Technical characteristics	Value
1	Displayed parameters number	4(6)
2	Max scale of pointer indicator for displaying main load, t	from 24
3	Vernier additional scale, t	from 4,5
4	Length of digital data display, symbols	4(3)
5	Operating temperature range, °C	-45 ... +65
6	Ex marking EAC	1ExibIIAT5GbX
7	Ex marking ATEX	II2GExibIIAT5Gb
8	Rated supply voltage, W	12 ... 18
9	Ingress protection IEC 60529	IP 65
10	Power Supply GOST 12.2.007.0-75	III
11	Weather resistance GOST 15150-89	NF1
12	Cable length, m	100

MI-140(P4), MI-140(P8), MI-140(P9), MI-140(P12) examples of being produced Display Modules are showed on the figures below.



Figure 7. MI-140(P4) (in vertical side)

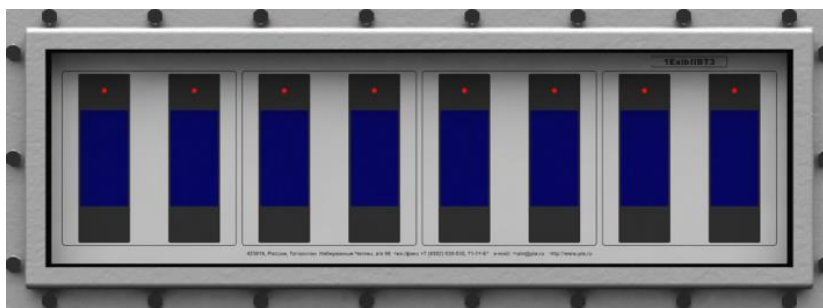


Figure 8. MI-140(P4) (in horizontal side)



Figure 9. MI-140(P8) (in vertical side)



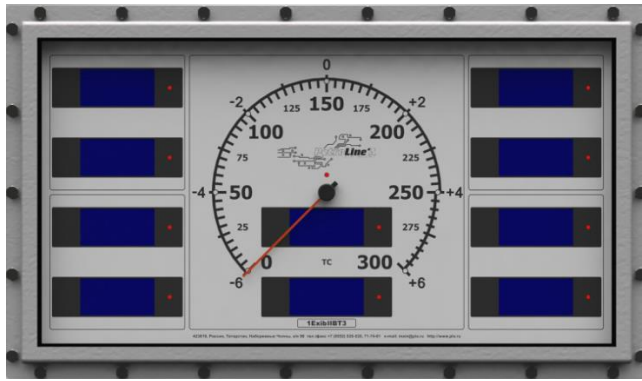


Figure 10. MI-140(P8) (in horizontal side)



Figure 11. MI-140(P9)



Figure 12. MI-140(P12)

Table 4. MI-140(P4)...(P12) Main technical characteristics and parameters

№ п/п	Technical characteristics	Value
1	Displayed parameters number	4-18
2	Max scale of pointer indicator for displaying main load, t	from 24
3	Vernier additional scale, t	from 4,5
4	Length of digital data display, symbols	4
5	Operating temperature range, °C	-45 ... +65
6	Ex marking EAC	1ExibIIAT5GbX
7	Ex marking ATEX	II2GExibIIAT5Gb
8	Rated supply voltage, W	12 ... 18
9	Ingress protection IEC 60529	IP 65
10	Power Supply GOST 12.2.007.0-75	III
11	Weather resistance GOST 15150-89	NF1
12	Cable length, m	100

Table 5. Dimensions, Display Module Weight

№ position	Device	Dimensions, mm	Weight, kg
1	MI-140(P1), MI-140(P2), MI-140(P3) Display Module	250×190×60	1,52
2	MI-140(PU) Display Module	250×190×60	1,46
3	MI-140C-4E, MI-140C(6P)E Display Module	400×300×60*	4,46
4	MI-140(P4) Display Module	550×200×60	3,44
5	MI-140(P8) Display Module	550×320×60	5,1
6	MI-140(P9) Display Module	430×440×60	6
7	MI-140(P12) Display Module	550×440×60	7,4

\*at the backside of indicator enclosure there is a loop of 33 mm height, 78 diameter

The manufacturer leaves the right to make changes in the design of display modules that do not deteriorate the technical parameters, without adjusting the operating documentation.

**1.1.4. MI-140(P1), MI-140(P2) Content**

All MI-140 indicators have enclosures made in the same style of the same depth. The height and width depends on the number of parameters displayed on the front panel.

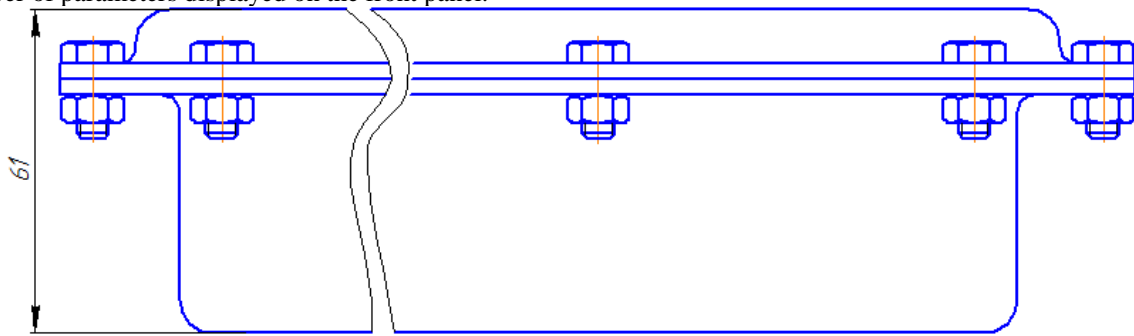


Figure 13. Display Module enclosure

Monitors of the Display Modules MI-140 (P1), MI-140 (P2) are made on seven segment indicators with increased light output. The display modules are designed to display the parameters of one or two sensors, used, as a rule, in addition to the basic configuration of the DEL-150 complexes. Display Modules have 2 segments of 4 characters. The Display Module MI-140 (P2) additionally has a connector for connecting a “driller's console” to enable and disable the “BIT LOAD” parameter.

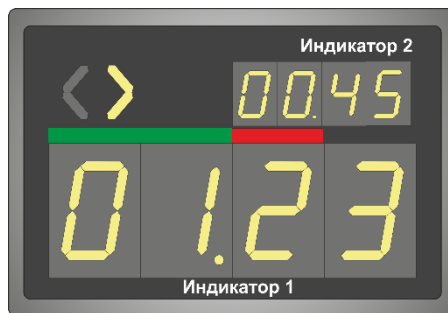


Figure 14. MI-140(P1), MI-140(P2)

Choice of indicated parameters on Display Module happens at order preparation moment on production facility and can be changed in a complex operating process.

**1.1.5. MI-140(P3) Content**

MI-140(P3) is aimed for showing 3 parameters used additionally for the main DEL-150 complete set. Display Module has 2 segments of 3 characters and LED columns for convenient perception of displayed information.

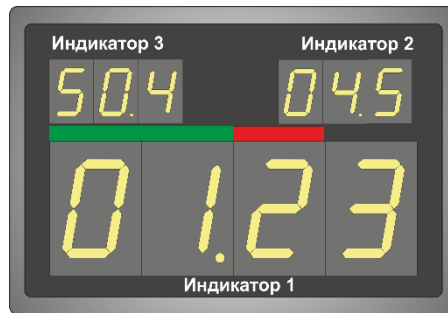


Figure 15. MI-140(P3)

Choice of indicated parameters on display module happens at order preparation moment on production facility and can be changed in a complex operating process.

**1.1.6. MI-140(PU) Content**

MI-140 (PU) is designed to display the readings of the mud level, in addition to the basic configuration of the DEL-150 complex. The Display Module has 4 panels of 3 digits and the corresponding columns of LEDs for easy perception of the displayed information.

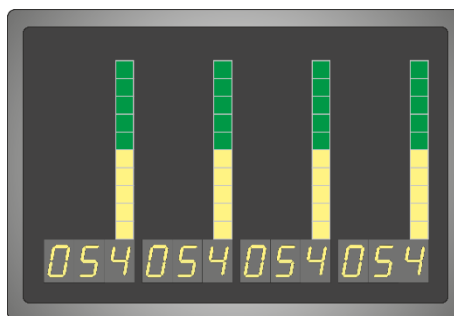


Table 16. MI-140(PU)

Choice of indicated parameters on display module happens at order preparation moment on production facility and can be changed in a complex operating process.

**1.1.7. MI-140S-4E, MI-140(6P)E Content**

Display modules MI-140S-4E, MI-140 (6P)E have a dial with a pointer driven and controlled by a low-current stepping motor to display the “hook load” parameter. The readings of the arrow are duplicated on four seven-segment indicators. Three-color seven-segment indicators are used at these display modules, which allow you to change the color from green to red, and use this property to display elevations.

MI-140S-4E Display Module is designed to display 4 parameters of 3 sensors, which are used in the basic configuration of the DEL-150 complex. MI-140C-4E has 3 segments of 4 characters and one three-digit segment.

MI-140 (6P) E Display Module is designed to display 6 parameters of 6 sensors, used, as a rule, in the main and additional configuration of the DEL-150 complex. MI-140 (6P) E has 3 segments of 4 characters and 3 segments of 3 characters, as well as an additional vertical line of LEDs for displaying the parameter “MUD LEVEL” or “MUD OUTPUT”.

Display modules MI-140S-4E, MI-140 (6P) E additionally have a connector for connecting a “driller's console” to enable and disable the “BIT LOAD” parameter.



Figure 17. MI-140C-4E



Figure 18. MI-140C(6P)E

### 1.1.8. MI-140(P4)...(P12)

MI-140(P4)...(P12) Display Module are universal modules with opportunity for free integration of standard size information fields.

Table 6. Variants of display module informative panels.

Panel 240×240 (main) With electronic parameter writing	Panel 120×120 (1 add.)	Panel 120×120 (2 add.) With electronic parameter writing	Panel 120×120 (2 add.) With electronic parameter writing

Enclosures from 4 to 12 panels 120×120 (mm) are created for current Display Module range.

Table 7. Enclosures variant of Display Module and their positioning

4 segments	8 segments	12 segments	9 segments

Display modules MI-140 (P4) ... (P12) are designed to display 4 -18 parameters used, as a rule, in an extended configuration of the DEL-150 complexes. Digital indicators of this line of display modules have an electronic signature of the parameter that allows you to display the values of any measured parameters that require constant visual inspection.

Table 8. Examples of parameter electronic lettering

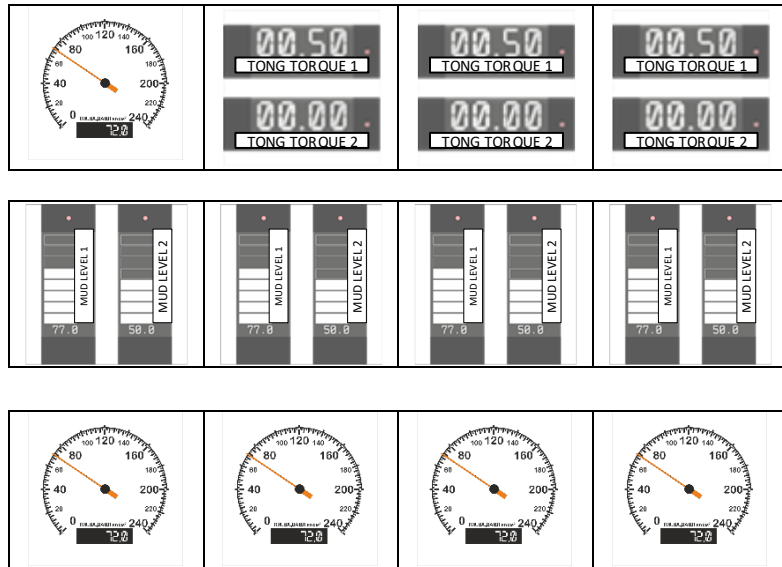
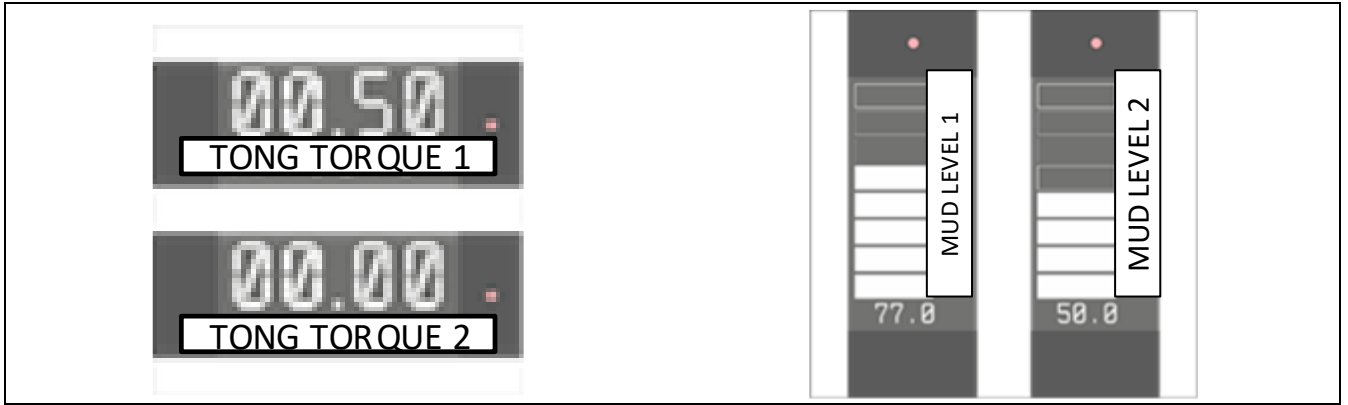


Figure 19. MI-140(P4) examples

Possible variants of informative panels are showed on the figures. When using a panel with a pointer, a scale is printed by customer's request

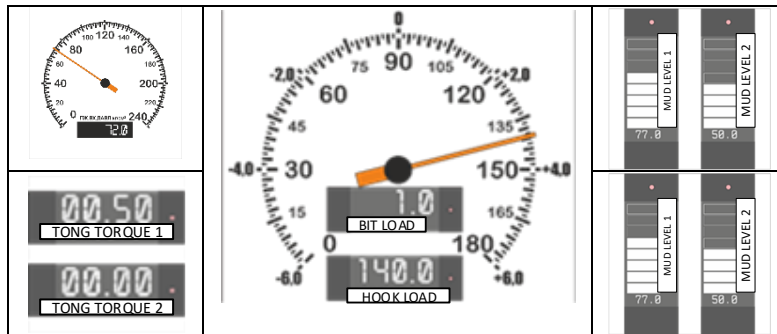
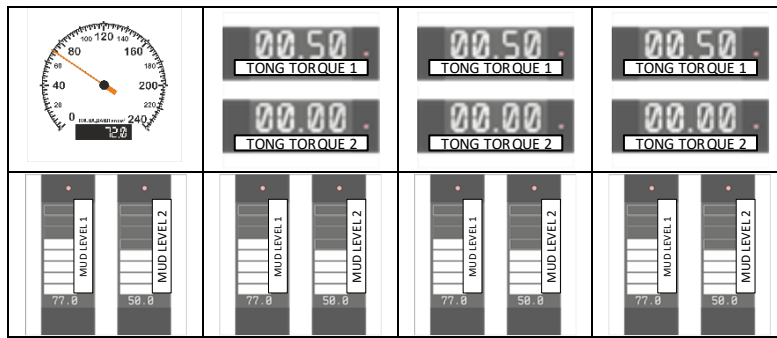
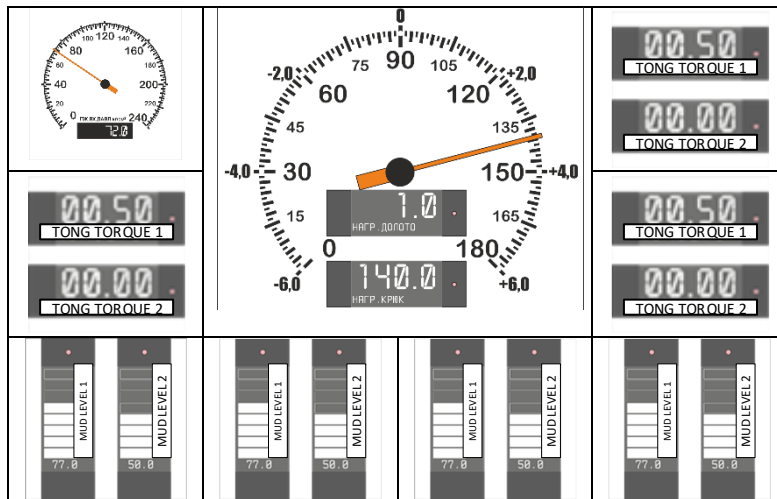


Figure 20. MI-140(P8) Examples

Possible variants of informative panels are showed on the figures. When using a panel with a pointer, a scale is printed by customer's request



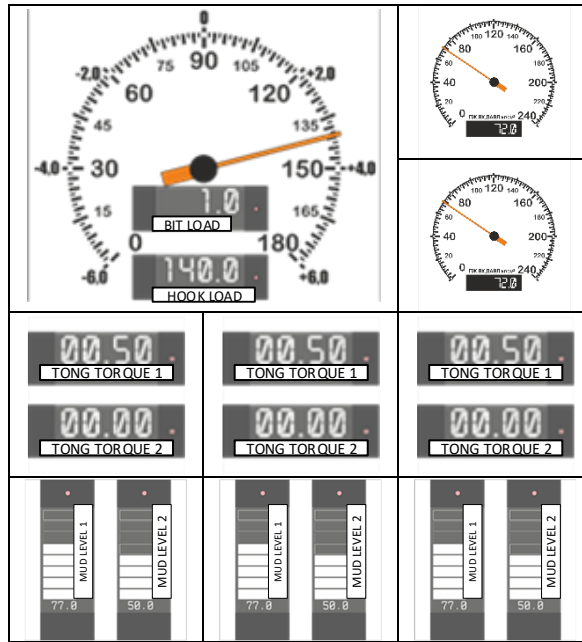


Figure 21. MI-140(P12) Examples

Possible variants of informative panels are showed on the figures. When using a panel with a pointer, a scale is printed by customer's request

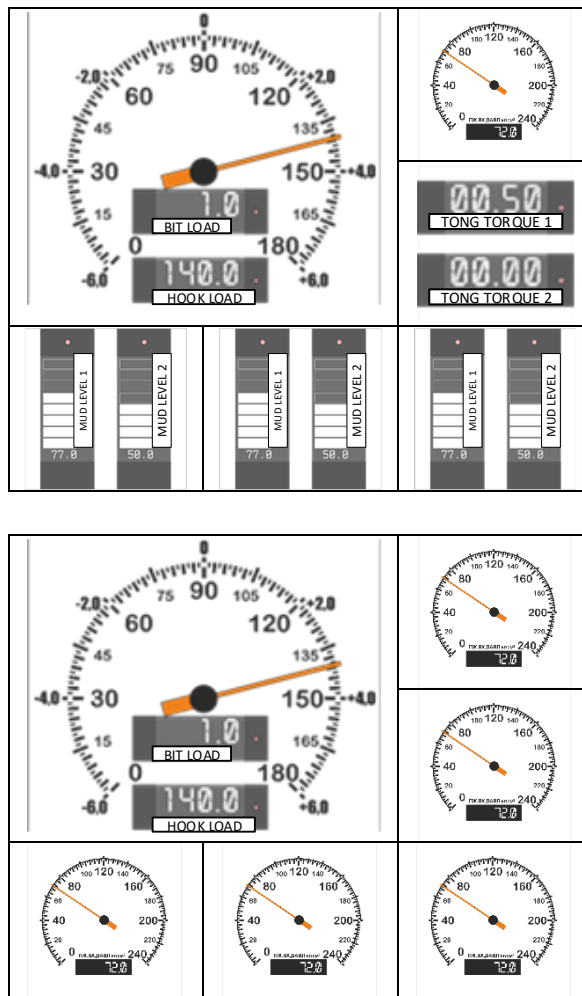


Figure 22. MI-140(P9) Example

Possible variants of informative panels are showed on the figures. When using a panel with a pointer, a scale is printed by customer's request

### 1.1.9. MI-140. Measure Units explanation of technological parameters indicated on

#### Display Module MI-140

Measure Unit choice of indicated parameters are done via Control Module keyboard if the necessary functions are available for necessary parameters.

Table 9. Parameters and measure units are indicated on Display Module which are used in the DEL-150 system.

PARAMETER	Available Measure Units	
Hook load (1-2)	ts	
Vernier	ts	
Bit load	Ts	
Hydraulic tong pressure (1-2)	kg/sm <sup>2</sup>	mPa
Hydraulic tong torque (by pressure)	ts*m	kN*m
Manual tong torque	ts*m	kN*m
Automatic tong torque	ts*m	kN*m
Tong torque (1-3)	ts*m	kN*m
Mud pressure on input (1-3)	kg/sm <sup>2</sup>	mPa
Mud pressure on output	kg/sm <sup>2</sup>	mPa
Temperature	°C	
Mud temperature on output	°C	
Mud pressure on input	°C	
Mud output	%	
Pump rpm	rpm	
Pump consumption (1-8)	l/s	
Pump rod strokes (1-6)	strokes/min	
Mud level (1-16)	m <sup>3</sup>	
Mud level sum (1-2)	m <sup>3</sup>	
Inlet rate	l/s	
Mud density (1-8)	g/sm <sup>3</sup>	
Gas (1-32)	%LFL	mg/ m <sup>3</sup>
Number of tripping rate operations	unit	
Rotary Torque	ts*m	kN*m
Rotary Rpm	rpm	
Top Drive System rpm	rpm	
Top Drive System torque	ts*m	kN*m
Travelling Block Position	m	
Bottomhole Depth	m	
Rate of penetration speed	m/s	
Tripping rate	m/s	
Bit position	M	
Fuel level (1-8)	L	
Fuel consumption (1-4)	l/h	
Wind velocity	m/s	
Guy line (1-8)	ts	
Date		
Time		

#### 1.1.10. Structure and operationing

MI-140 Display module has a built-in microprocessor control, RS-485 digital channel for communication with the MU-150 control module, and a stabilized power supply circuits.

Information update on indicators of display modules occurs every 100 ms.

To make output on Display Module of emergency information on exceeding the set threshold for gases, it is possible to replace the value of the parameter "HOOK LOAD" with the blinking inscription "GAS".

For the field with the pointer indicator, the change of units of measurement affects only the value of the digital indicator, the pointer works on a scale and in the units of measurement displayed on the indicator.



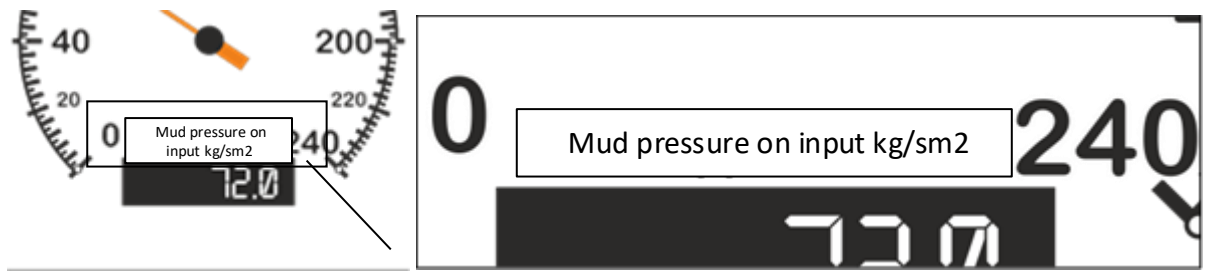


Figure 23. Example of parameter scale “Mud pressure on input”

#### 1.1.11. Measuring instrument and tool

While mounting, commissioning and operation special measure units are not necessary.

For mounting and maintenance of MI-140 in the DEL-150 complex, standard instruments of control and measurement instruments specialist and wireman are used. (see Operation Manual the DEL-150).

#### 1.1.12. MI-140 Ex providing

The devices in complex of the dynamometer electronic DEL-150 are made in accordance with the requirements of technical regulations TR TS 012/2011 "On safety of equipment for work in explosive atmospheres", have a performance that provides the level and type of protection in accordance with

GOST 30852.0-2002 (IEC 60079-0: 1998);

GOST 30852.10-2002 (IEC 60079-11: 1999) (sign Ex).

See Operation Manual DEL-150.

MI-140 Display Module is placed in Ex zone and Ex rated.

Table 10 – Ex marking

MI-140, MI-140S Display Module	1ExibIAT3Gb
--------------------------------	-------------

#### 1.1.13. Marking and sealing

Markings on the enclosure of the components of the dynamometer electronic MI-140 includes the following data:

1. Trademark or name of the manufacturer;
2. Type of product;
3. Serial number and year of manufacture;
4. Marking of Ex;
5. Special sign of explosion safety;
6. The range of ambient temperatures during operation;
7. Name of the certification body and the number of the certificate of conformity.

Other data required by regulatory and technical documentation, which the manufacturer must reflect in the labeling, may also be used.

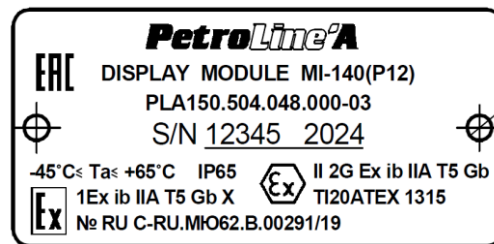


Figure 24. Marking examples

The enclosures of devices containing electronic circuits and electromechanical components are sealed to prevent unauthorized access. Repair is made by the manufacturer or a specialized company, which delegated authority for repair.

#### 1.1.14. Packaging

For transportation of MI-140 plywood with metal carrying handles are used.

Table 11 – shipping cargo container.

Device	Dimensions, mm	Weight, kg
Load Transfer Case for MI-140S	540×460×340	5

## 2. Usage

---

### 2.1. Operational constraints

#### 2.1.1. Ex rating in operating

To operate the MI-140 as part of the electronic dynamometer DEL-150, it is allowed for personnel who have studied this manual the "Operation Manual for the DEL-150", and have passed the appropriate instructions and have the necessary tolerances for work in hazardous areas.

When operating the complex, it is necessary to be guided by:

- chapter 3.4 POT R M-016-2001 "Safety Regulations for the operation of electrical installations";
- the current rules of electrical installations
- requirements of pp this guide.



**It is necessary to control device conditions and communication cables while operating. If there are any mechanical damages of the DEL-150 and communication cables between them you should stop using them.**

While operating it is forbidden to damage seals and open all devices included in the complex of electronic dynamometer DEL-150..

It is forbidden to connect and disconnect the connectors of connecting cables and grounding conductors with the dynamometer on.

In case of malfunctioning, replace the faulty device with a good one, connecting it according to the documentation. After replacement, check the reliability of the connections and grounding of the modular buildings to the weight of the lift.

During operation, periodically check the status of communication cables. If a violation of the protective layer on the cable lines is detected, immediately turn off the power supply and replace the damaged cable.

Do not allow the violation of the sealing devices. If faults are detected, switch off the power supply and replace the faulty device.

If mechanical damage is found, remove the faulty device and send for a repair.

### 2.2. Preparation of MI-140 usage

#### 2.2.1. Safety precautions at MI-140 preparation

While Display Module operating it is necessary to follow PTEE from 31.03.92 policy and «Safety regulations for the operation in oil and gas industry», approved by Gosgortekhnadzor Russia in accordance with the Federal Law «Industrial safety of hazardous production facilities ».

#### 2.2.2. Ex providing while mounting and dismantling

While mounting and dismantling of devices in the complex of electronic dynamometer DEL-150 and preparation it to work you should follow GOST R 51330.13-99 (IEC 60079-14-96), GOST 30852.13-2002 (IEC 60079-14:1996) PTEE policy from 31.03.92 y. and chapter 7.3. PUE (see. «Operation Manual DEL-150»)

#### 2.2.3. Volume and sequence of MI-140 external check

External examination includes checking:

- state of contacts, flexible connections and leads;
- availability of mounting bolts and nuts;
- tightness of fastening bolts of indicators and other devices;
- integrity of displays, glass surfaces;
- integrity of the painted surface of the display module case.

#### 2.2.4. Rules and sequence of readiness checking for usage

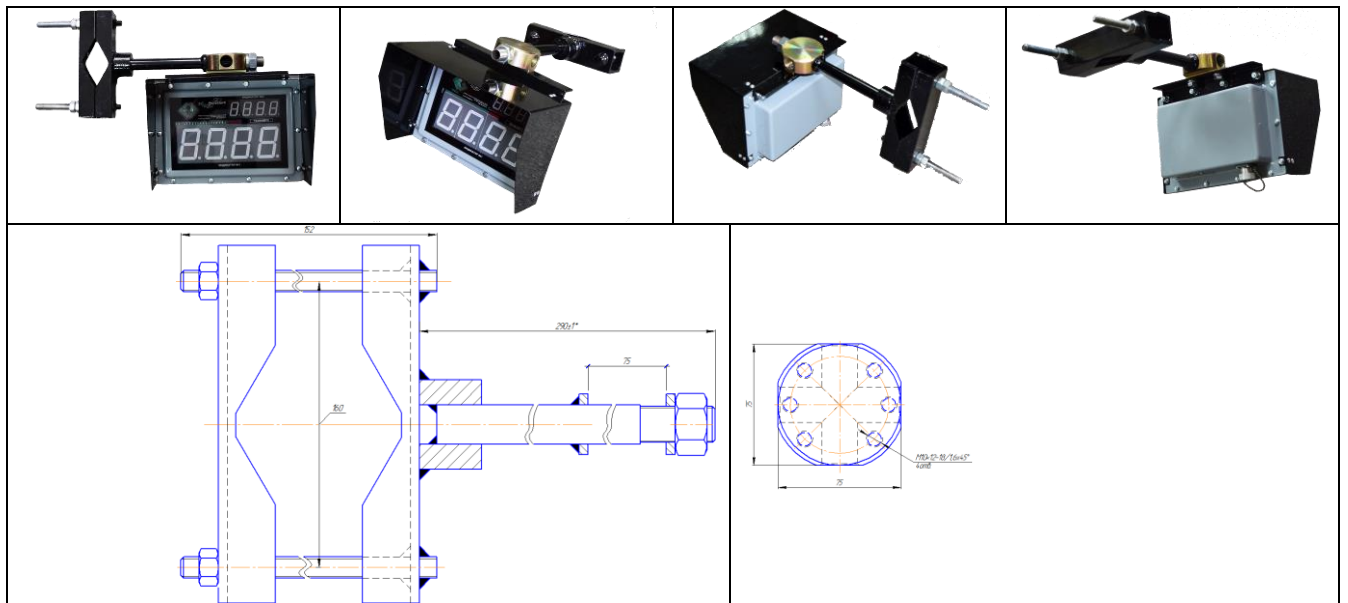
- Check the reliability of the display module;
- Check the reliability of the connection of all connectors on the control module and the display module;
- Check that the sun visor is secure.

#### 2.2.5. MI-140 Orientation Indication

- One or several Display Module should be mounted on the site in the field of view of the driller without blocking the view of the working area, at the level and at a distance convenient for the perception of information. The second connector of the display module is designed to connect the driller's console.

- The display module can be installed on the mast support or in the control cabin of the lifting mechanism;
- The display module can be placed on a suitable vertical surface at a height convenient for viewing the display;
- Display modules can be mounted in the dashboard of the driller's cabin fig. 25-30 (depending on the indicator modification). For this purpose, the control module connectors, in agreement with the customer, are transferred to the back wall of the display module.

Table 12. Examples of support bracket MI-140.



There are more than 15 positions of support bracket for Display Module which able to choose optimal positioning angle of display in driller's working area.

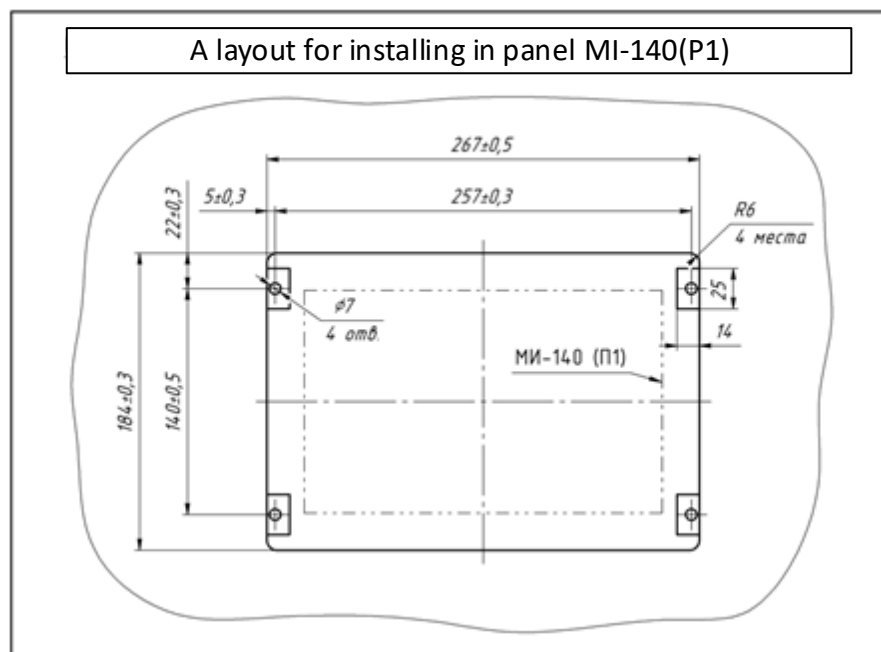


Figure 25. A layout for installing in panel MI-140(P1), MI-140(P2), MI-140(P3), MI-140(PU)

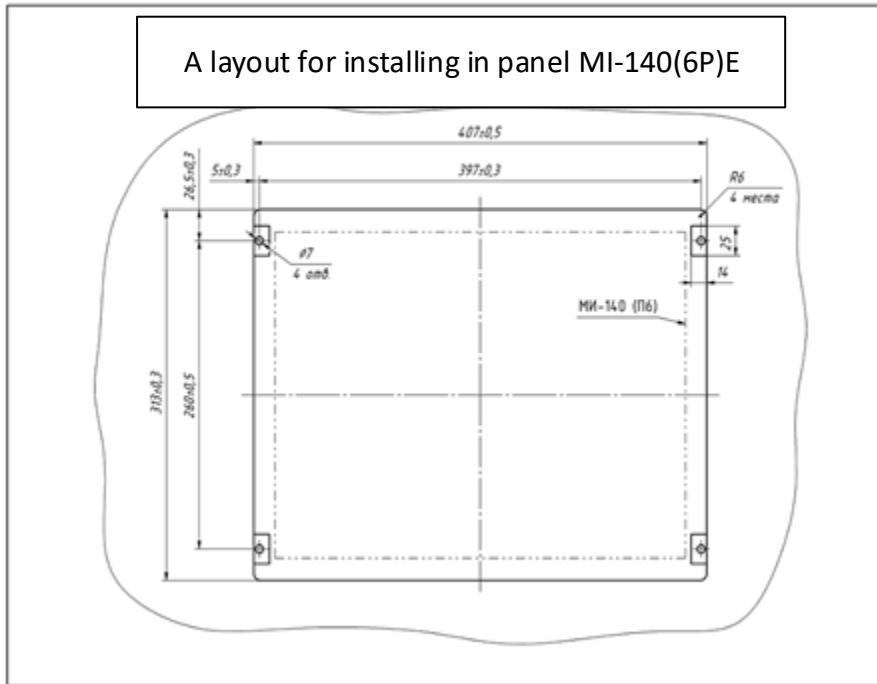


Figure 26. A layout for installing in panel MI-140S(4E), MI-140S(6P)E

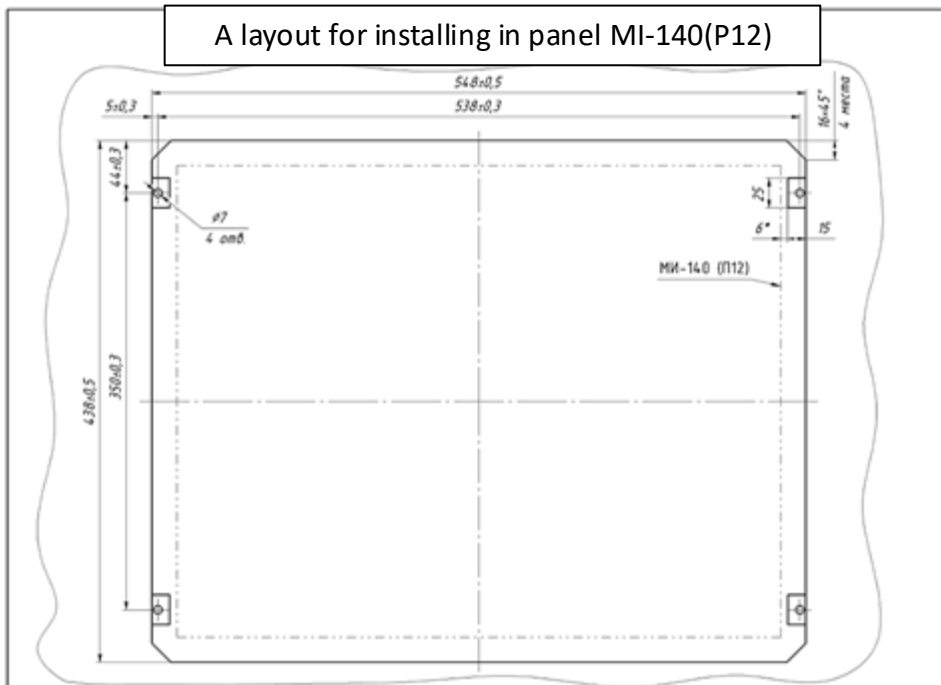


Figure 27. A layout for installing in panel MI-140 (P12)

A layout for installing in panel MI-140 (P4) of PLA  
150.504.145.000

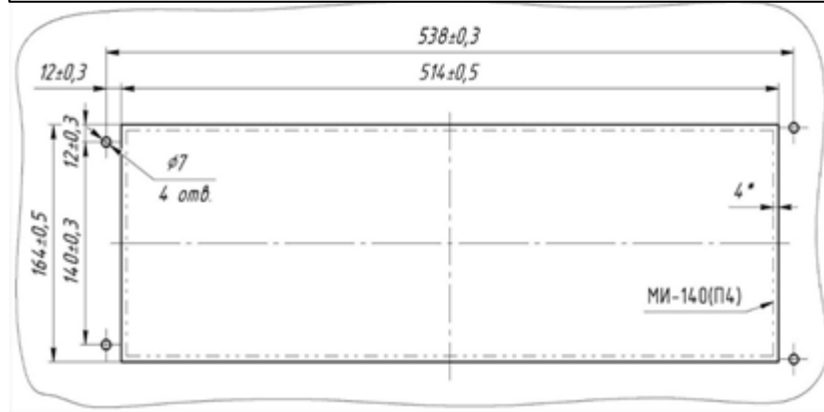


Figure 28. A layout for installing in panel MI-140(P4)

A layout for installing in panel MI-  
140(P8) of PLA 150.504.146.000

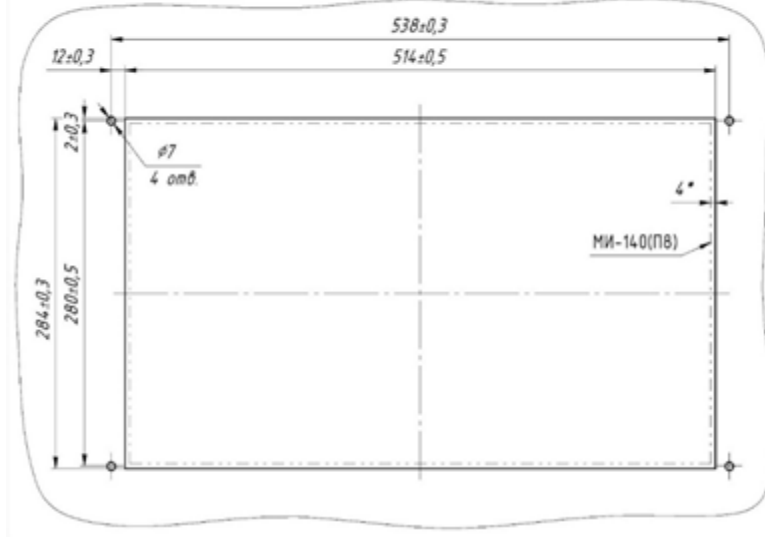


Figure 29. A layout for installing in panel MI-140(P8)

A layout for installing in panel MI-140(P9) of PLA  
150.504.147.000

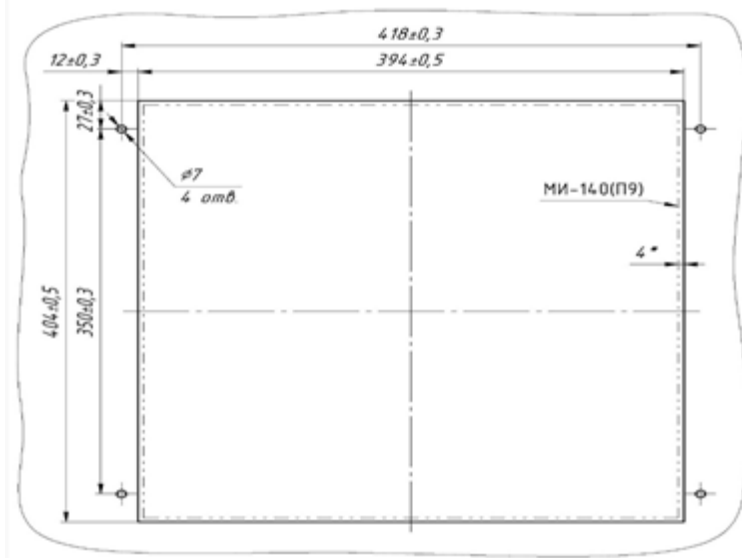


Figure 30. A layout for installing in panel MI-140(P9)

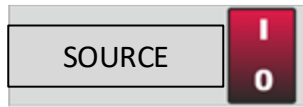
**2.2.6. MI-140 connection between other devices.**

Display Module MI-140(P1)...(P12), MI-140S-4E, MI-140(6P)E work in the complex of control module the DEL-150. Display Module MI-140(P4)...(P12) with control module the DEL-140 don't interact.

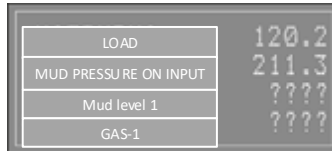
**2.2.7. MI-140 Switching on and testing**

After finishing the mounting and switching on the communication cable to control module, it is necessary to make the first switching on.

Switching on a device:



After control module works in an operating mode and parameters with current values line by line are indicated on the screen,



Analogue values are appeared on the control module regarding module settings.

???? – malfunction or absence of the primary converter (current sensor)

---- - loss of communication with sensor.

**2.2.8. Contractions accepted in the DEL-150 system parameters displaying on control module screen and display module.**

Table 13. List of parametersN(available measure units).

Parameter
Load on rope
Load on instrument
Load on rope tong
Tong torque
Tong torque 2
Tong torque 3
Tripping rate
Trippind depth position
Hydraulic tong torque pressure
Mud pressure on input
Hydrorotor torque
Mud pressure on output
Ambient temperature
Mud temperature on input
Mud temperature on output
Mud output
Mud flow speed (consumption)
Rotary torque
Rotary rpm
Pump consumption
Pump consumption
Pump consumption
Pump consumption
Mud level/ volume
Mud level/ volume
Mud level/ volume
Mud level/ volume
Mud level/ volume
Mud level/ volume

Mud level/ volume
Mud level/ volume

A list of parameters can be enlarged in the future

### 2.3. MI-140 Usage steps

- Switching on the device;
- Checking the list of set devices;
- Checking of value compliance on control module to parameter values on display module.

#### 2.3.1. A view of connected devices list on the control module display MU-150

There is opportunity for checking of set devices list. There is a list of contracted devices (sensors, blocking plates, indicators) and address on the bus RS-485.

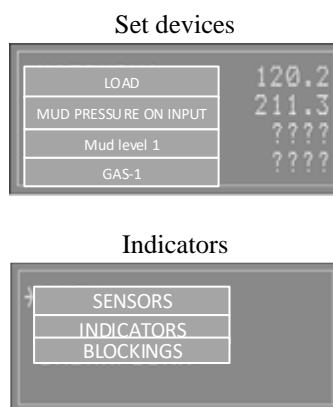


Figure 31. Layout of parameters depicting on digital module display

Table 14 – Device addresses on the bus RS-485.

№	Set Devices	Writing on MU-150 display	dec
1	Indicator with button 1	MI(CONSOLE)1	128
2	Indicator with button 2	MI(CONSOLE)2	129
3	Indicator with button 3	MI(CONSOLE)3	130
4	Indicator with button 4	MI(CONSOLE)4	131
5	Indicator 1	MI-1	132
6	Indicator 2	MI-2	133
7	Indicator 3	MI-3	134
8	Indicator 4	MI-4	135
9	Indicator 5	MI-5	136
10	Indicator 6	MI-6	137
11	Indicator 7	MI-7	138
12	Indicator 8	MI-8	139

Display modules working in the DEL-140 system require upgrading of software for working in the DEL-150 system. After upgrading, a writing with device address is depicted on a main digital indicator when display module starts.

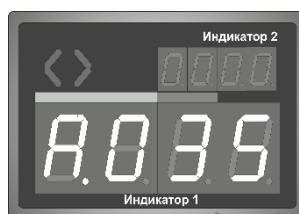


Figure 32. Example of MI-140 address writing

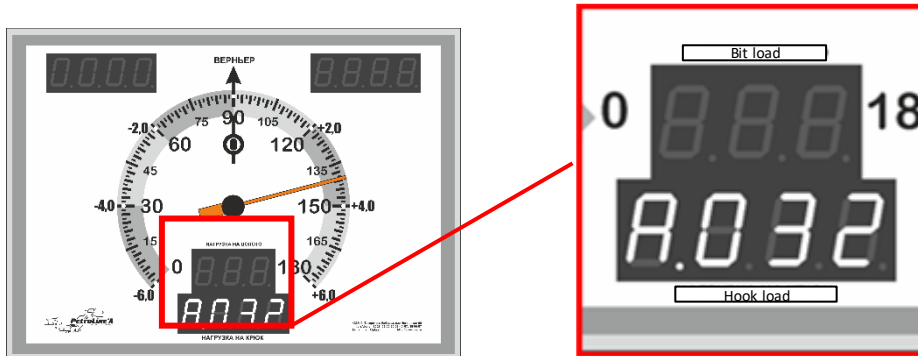


Figure 4. Example of MI-140S address writing

### 2.3.2. MI-140 possible malfunctions while usage and recommendations for decoupling them

The DEL-150 system group malfunction:

1. Cable malfunction;
2. Antenna malfunction;
3. Sensor malfunction;
4. Module display malfunction;
5. Malfunction of the “RS-485” card on the backplane
5. Control module malfunction;
6. Error power module;
7. Error configured device;
8. RS-485 converter malfunction;
9. Interface device malfunction;
10. Interfering signal between antenna.

Table 15 – MI-140 Malfunction correction.

№	Malfunction	Group	Steps of actions
1	On the display module there are no readings of all sensors, on the display of the control module all parameters are normal.	1, 4, 5, 6	1.1. Replace the cable; 1.2. Start the search for sensors. 4.1. Replace indicator; 4.2. Run a search for sensors. 5.1. Switch the indicator to another MU or MC connector 5.2. Run a search for sensors. 6.1. Replace MU or MC. 6.2. Run and enter settings.
2	On the display module there are no readings of all sensors, on the display of the control module all parameters are normal.	8, 4	8.1. Reconfigure indicator; 8.3. Check the device address; 8.2. Run a search for sensors. 4.1. Replace indicator; 4.2. Run a search for sensors.
3	Wrong meter readings	8, 3	8.1. Recheck parameter settings. 3.1. Replace the sensor; 3.2. Run a search for sensors.

### 2.3.3. The list of MI-140 operation modes and its main operation characteristics

There are 5 operation modes of MI-140:

- Boot mode;
- Operation mode;
- «Drilling» mode;
- «VERNIER» mode;
- Alarm Threshold mode;
- Service mode.



### 2.3.4. Boot mode, changeover to «operating mode».

«Boot mode» automatically starts in the moment of switching on control module. While booting the definite LED flash on. Then panels referring to set parameters flash on. Indicators of unconnected parameters don't flash on. This state is called «operating mode». In operating mode parameter values on Control Module display match to Display Module values.

Table 16. Indicator positioning of «boot» LED.

LED in Display Module panel MI-140(P4)...(P12)	LED of Display Module MI-140(P1)...(P3)	LED of Display Module MI-140(PU)	LED of Display Module MI-140S-4E, MI-140(6P)E

### 2.3.5. Alarm threshold mode.

«Alarm threshold mode» is activated separately for each segment of the Display Module if the value of this parameter exceeds the set threshold. In the threshold mode, monochrome lights blink at a constant frequency, and bicolor lights change color from green to red.

In cases when the red color is selected as the main color of the operating mode, such indicators in the exceeding mode behave like monochrome.

### 2.3.6. «Drilling» mode.

The «Drilling» mode is activated by pressing the corresponding button of the driller's console. After pressing the button, a value appears in the «bit load» window.

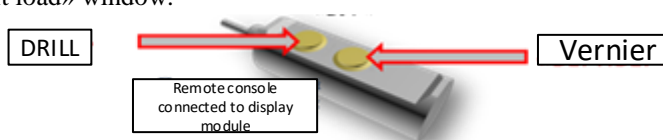


Figure 33. Remote console «push button station»

Short rules of switching on mode and switching off:

Hook load mode switch on every time before drilling process and switch off right after before next boost up.

### 2.3.7. «Vernier» mode

Mode is available only for Display Module with extra scale of pointer indicator. Standard scale range: -4,5...+4,5 тс; -6...+6 тс. «Vernier» mode is switched on by pushing button on driller's console. After button pushing a pointer of an indicator stands in a vertical position that refers to «0» of additional scale.

### 2.3.8. «Service» mode

Service mode is a mode of parameter distribution according to particular Display Module panels. Service mode is available when Display Module is connected to PC with installed software.

### 2.3.9. MI-140 Switch off, content and sequence check after work termination

After work termination in order to switch off a device it is necessary to push source button on Control Module facelift.

Before dismantling or moving communication cable and driller's console cable must be disconnected.

Checking must be carried out reg the DEL-150 operation manual instructions.

## 2.4. Act in emergency situations

### 2.4.1. Failers that can lead to accidents

In case of failures that can lead to emergency situations, it is necessary to replace the failed device. If necessary, disable additional devices that control non-technological parameters.

In other cases that are not described in this manual, follow the Federal rules and regulations in the field of industrial safety «Safety rules in the oil and gas industry»

## 3. Maintenance

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### 3.1. MI-140 Maintenance

#### 3.1.1. General information

Maintenance is divided into:

- daily maintenance;
- periodic maintenance performed after working off a certain time, and after the move (before installation).

Operational and routine maintenance of the MI-140 is performed by personnel whose responsibilities include ensuring the operability of the complex. The list of these works includes:

- check the status and control of the instrument;
- checking and monitoring the parameters of the MI-140;
- operational actions for the replacement of damaged components with the registration of acts;
- check the inclusion of blocking signals;
- registration in the form according to the forms recommended by the manufacturer of all recorded deviations, failures, work performed and other information.

#### 3.1.2. Safety measures

When operating the complex, it is necessary to be guided by:

- chapter 3.4 «Electrical installations in hazardous areas» PEEP;
- current regulations for electrical installations;
- this operational documentation (ED) and other regulatory documents operating at the enterprise.

During operation, it is prohibited to open all devices that are part of the electronic dynamometer the DEL-150.

Works should be done upon requirement, but at least once a month:

#### 3.1.3. MI-140 Maintenance procedure

Maintenance is carried out in the following order:

1. Decontamination of the sensor and indicator enclosures;
2. Checking the safety of seals;
3. Decontamination the glass surfaces of the indicators;
4. Check availability and durability of fasteners;
5. Decontamination of connectors and contact groups;
6. Check for visible mechanical damage;
7. Replacement and (or) repair of damaged cable products;

8. Replacing of damaged sensors, indicators, other devices and components.

Wash the contacts of the connectors with an alcohol-gasoline mixture (need 3 ml) with a soft brush.

**The absence of marks on carrying out maintenance in the Form (section "Accounting for technical services") ATTRACTS A VIOLATION OF THE OPERATING RULES, and the manufacturer has the right to withdraw the warranty.**



#### 3.1.4. MI-140 Work Capacity Check

- Switch on Control Module;
- Check switching on of «boot» LED;
- Check the list of connected devices;
- Check reflection of the relevant parameters on the Display Module.

## **4. Current Maintenance**

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### **4.1. MI-140 Current Maintenance**

#### **4.1.1. General information**

Repair is done on manufacturer plant or at specialized enterprise.

## **5. Storage**

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### **5.1. Storage conditions**

The entire nomenclature requires careful treatment, storage in dry, clean rooms with a constant temperature. The optimal storage conditions are considered to be from 10 to 35 ° C, the relative humidity of the air is not more than 80%. Daily temperature fluctuations should not exceed 5 ° C.

Devices arriving at the warehouses in the packaging of the factory are not unpacked, packaged on flat pallets and stacked in a stack or in the cells of the racks.

Devices sealed by the factory cannot be opened in warehouses.

Small appliances and devices arriving in individual packaging are stored for storage in box pallets with installation in a stack.

Devices and components without individual packaging should be stored in the cells of the racks no more than 3 rows in height with the use of sealing materials between them.

Small devices and products arriving without packaging can be stored in fine-mesh racks and cabinets, while devices or products of the same type should be stored in the same cell.

## **6. Transportation**

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### **6.1. Transportation requirements and conditions**

Packaged transportation is allowed by all types of closed transport.

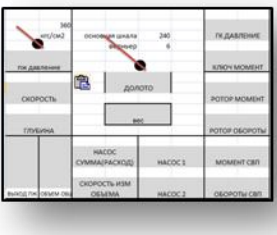
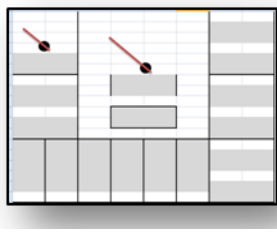
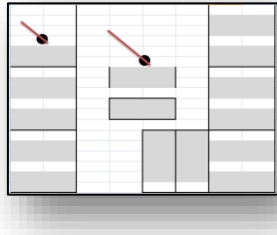
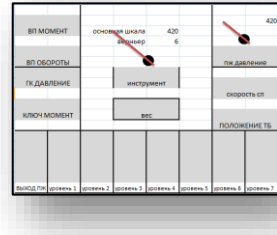
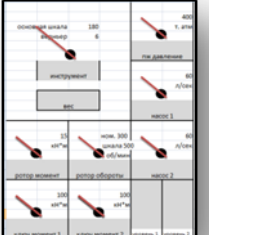
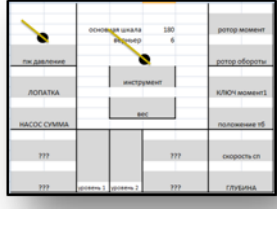
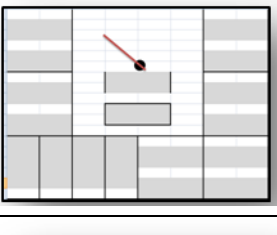
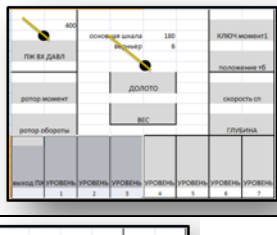
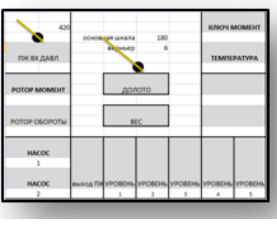

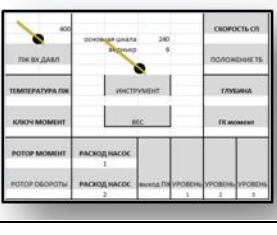
MI-140 in the package for transportation is allowed the impact of transport shaking with an acceleration of 30 m/s<sup>2</sup> with a frequency of impacts of 100 per minute.

## **7. Disposal**

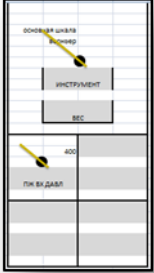
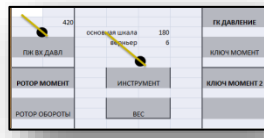
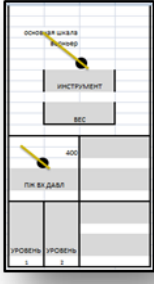
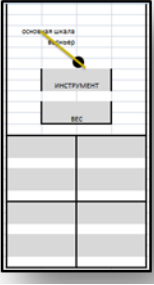

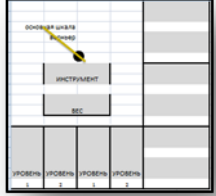

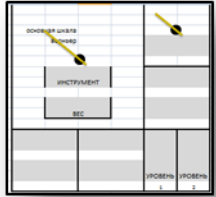



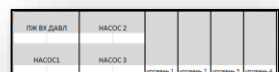
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MI-140 Disposal is made regarding requirements and standards used in oil and gas industry.

Application 1. MI-140(P4-P12) Modifications of front panels of Display Module

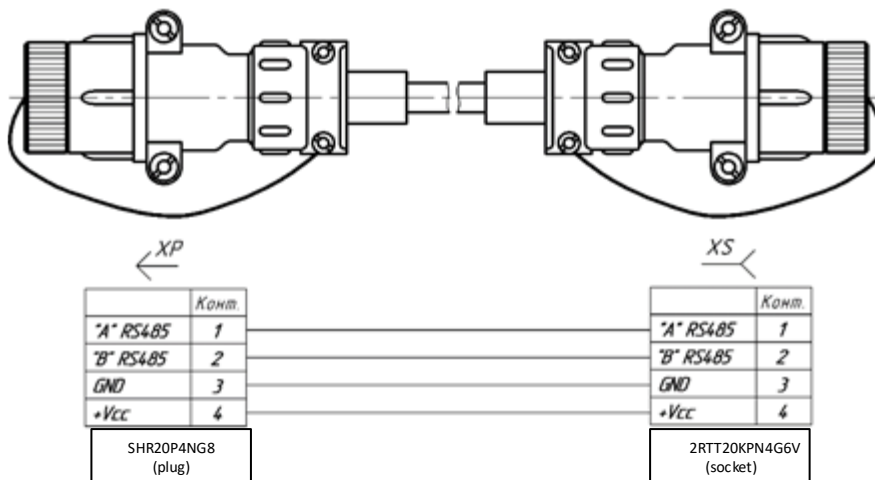
MI-140(P4-P12) Display Module modifications of front panels			
MI-140P12			
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	PLA 150.504.048.002-03		PLA 150.504.048.002-04
	PLA 150.504.048.002-05		PLA 150.504.048.002-06
	PLA 150.504.048.002-07		PLA 150.504.048.002-08
	PLA 150.504.048.002-09		PLA 150.504.048.002-10
	PLA 150.504.048.002-11		

MI-140P8

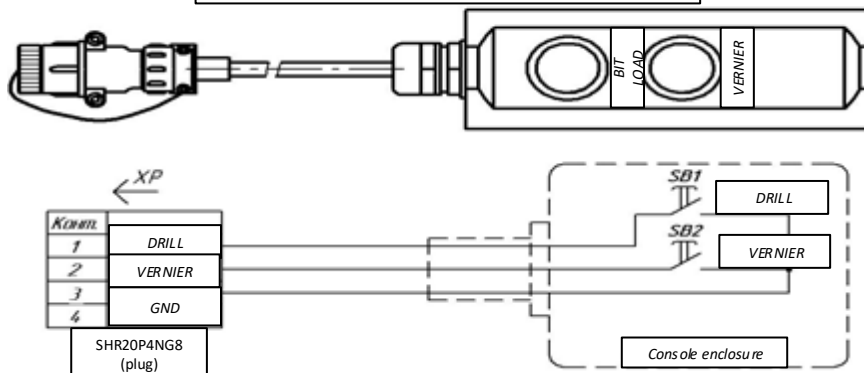
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	<p>PLA 150.504.046.002-02</p>		<p>PLA 150.504.046.002-03</p>
	<p>PLA 150.504.046.002-04</p>		
<p><b>MI-140P9</b></p>			
	<p>PLA 150.504.047.002</p>		<p>PLA150.504.047.002-01</p>
	<p>PLA 150.504.047.002-02</p>		<p>PLA 150.504.047.002-03</p>
<p><b>MI-140P4</b></p>			
	<p>PLA 150.504.045.002</p>		<p>PLA 150.504.045.002-01</p>
	<p>PLA 150.504.045.002-02</p>		

**Application 2. Pinout cable layout**

*Universal communication channel  
SHR20P4NG8/2RTT20KPN4G6V*



*Remote console with a cable*



*Communication channel DB-9/2RTT20KPN4G6V (plug)*

