Common rail pump inspection and testing equipment

CRP-FM measuring unit

Technical description of the measuring unit

Rev. 1-04

2022г

Contents

1. CRP- FM measuring unit

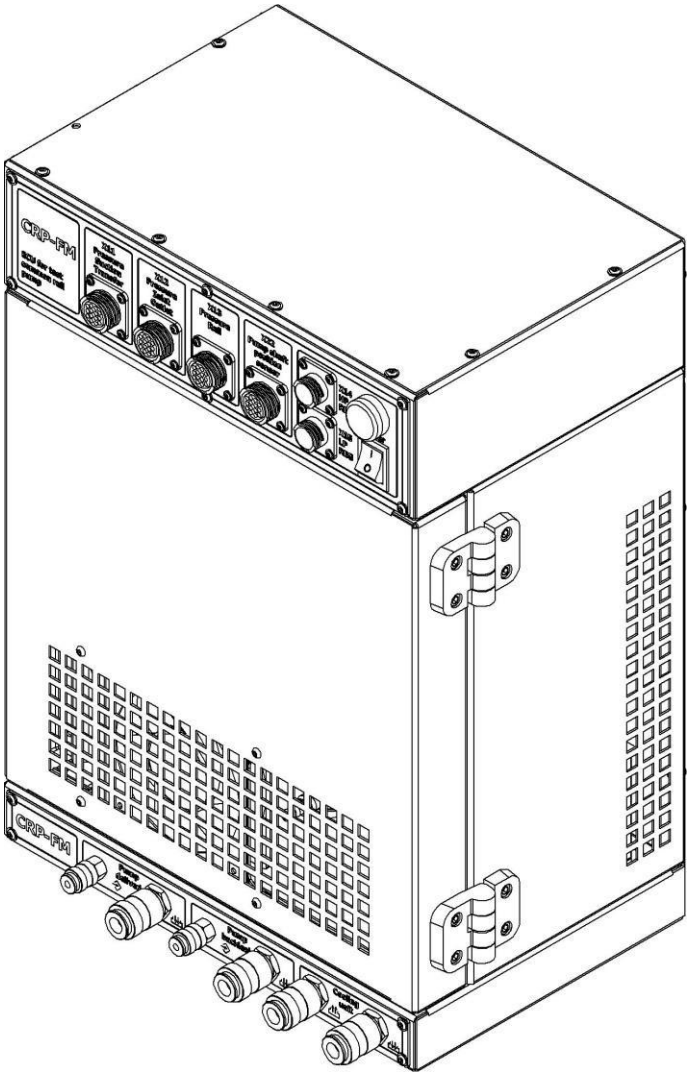


Figure 1.Exterior view of CRP-FM unit

Brief information

The CRP-FM metering unit is an electronic unit that controls the electrical components of the Common Rail fuel pumps and measures the volumetric flow and the pump return flow rate. It is used as part of the test bench equipment.

Measurement unit characteristics:

Number of supply measurement .....channels1 channel;
Number of return flow measurement .....channels1 channel;
Measuring range of measuring unit2 ..... .5-400 l/h;
Resolution capacity0 .....01 l/hour;
Measuring error in the range 2.5-400l/h, max. ..... 1 %;
Temperature range of the liquid to be measured..... 15-75°C;

Control unit specifications:

Number of pump regulator valve control .....outputs2 pcs;
Number of pressure regulator control .....outputs3 pcs;
Maximum output current, per .....channel3 A;
Current holding accuracy 0 .....1 A;
Number of pressure sensors to be .....connected5 pcs;
Number of pump shaft position sensors to be .....connected1 pcs;
Power supply .....voltage230V AC 50Hz;
Rated .....current5 A;

Overall dimensions .....HxWxD540x380x250 mm;
Net weight (excluding fluids and installation kit) .....35 kg;

Fluids used:

Test .....fluidCalibration oil ISO 4113;
Minimum volume of test liquid in the system ..... tank20 l;
Flow of test fluid through the cooling .....system8 l/min.

2. CRP-FM arrangement of main elements

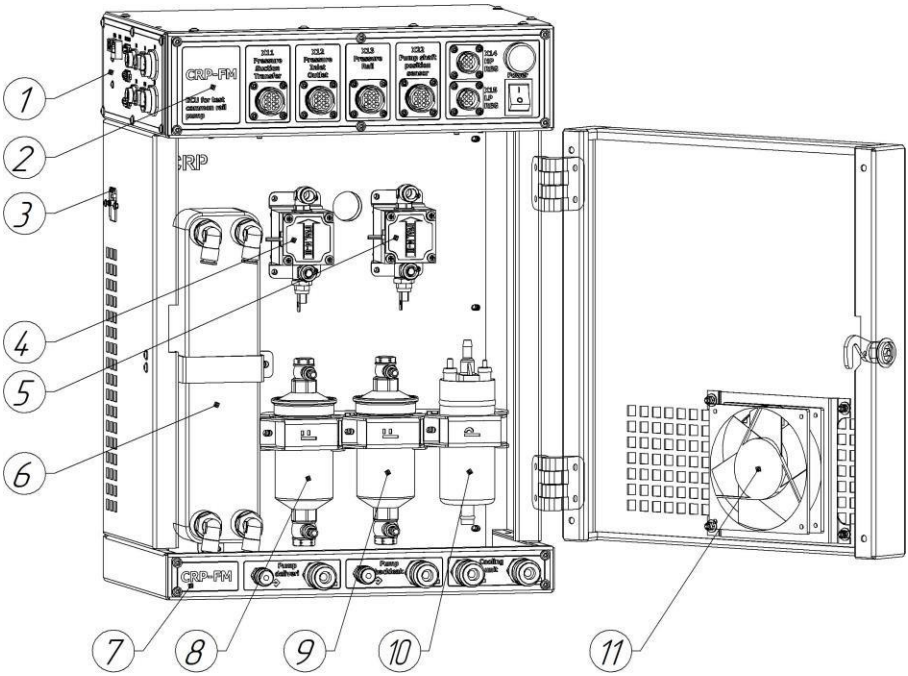


Figure 2: CRP-FM arrangement of the main elements

Position	Description
1	Electrical connection panel to the stand;
2	Electrical connection panel to the pump;
3	Electrical power connection socket;
4	Pump flow measurement sensor;
5	Measurement sensor for pump return flow;
6	Heat exchanger of the cooling system;
7	Hydraulic panel;
8	Pump flow measurement line filter;
9	Pump return flow measurement line filter;
10	Cooling system pump;
11	Filter and gauge cooling fan;

3. Electrical connection panel to stand

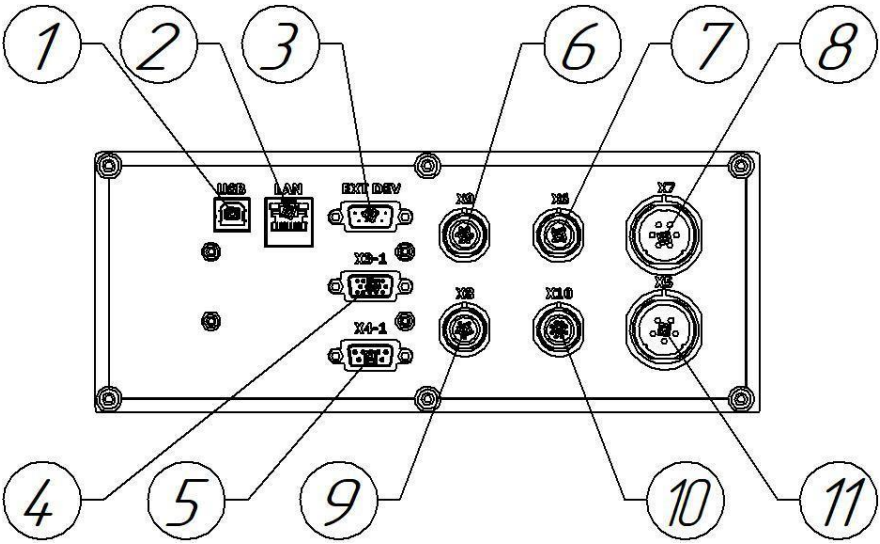


Figure 3.Electrical connection panel to the stand

Position	Description
1	USB connector, connection to a computer via USB;
2	LAN socket, connection to a computer via Ethernet;
3	EXT DEV connector, external device connection;
4	X3-1 connector, shaft angle position sensor (encoder) bench connection, for speed monitoring and control;
5	Connector X4-1, connection of stand shaft sensor, for speed monitoring and control;
6	X9 connector, frequency converter control output;
7	Connector X6, pressure sensor input;
8	X7 connector, control of the bench thermostat system;
9	Connector X8, stand tank fluid temperature sensor;
10	X10 connector, test bench sensors;
11	X5 connector, not engaged in CRP-FM unit.

4. Electrical connection panel to pump

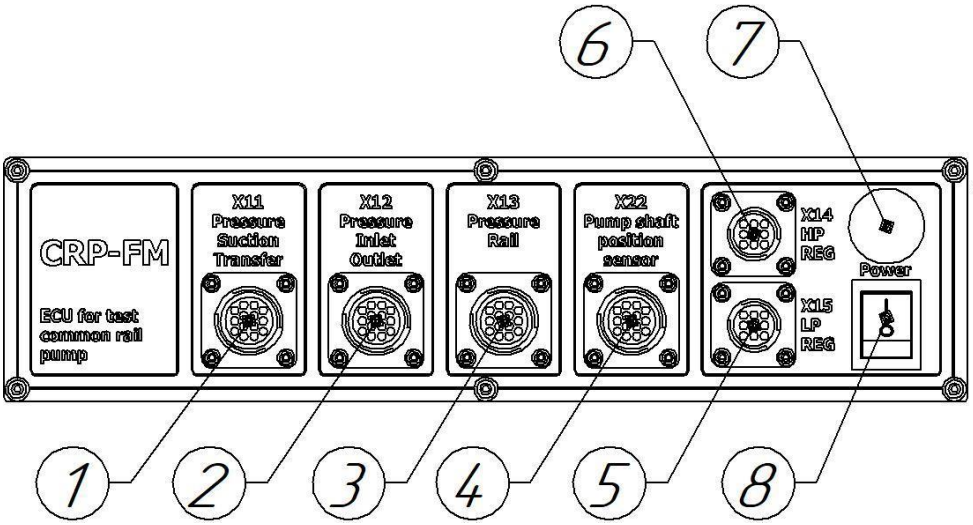


Figure 4.Electrical connection panel to the pump

Position	Description
1	Connector X11, pressure measurement of the booster pump and measurement of the vacuum system of the pump under test;
2	Connector X12, measuring the liquid inlet pressure to the pump and the pressure in the return flow line of the pump under test;
3	Connector X13, high rail pressure measurement;
4	Connector X22, shaft position sensor of the pump under test;
5	Connector X15, pump regulator valve control outputs;
6	Connector X14, rail pressure regulator control outputs;
7	Indicator for the electrical power supply;
8	Power supply toggle switch.

5. Hydraulic panel

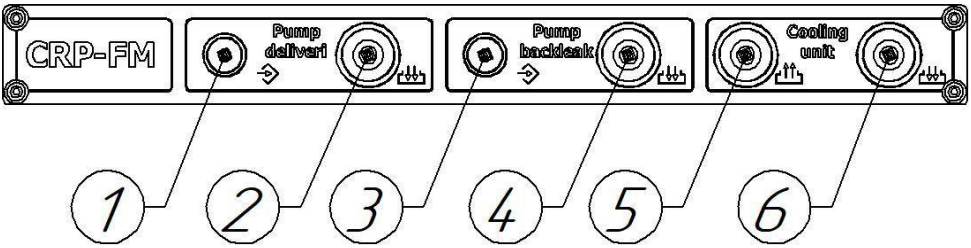


Figure 5.Hydraulic panel

Position	Description
1	Feed measurement input of the pump under test;
2	Drain back the measured liquid;
3	Backflow measurement input of the pump under test;
4	Drain back the measured liquid;
5	Cooling system pump inlet;
6	Back draining of the cooling system;

6. Wiring diagram for pump and rail

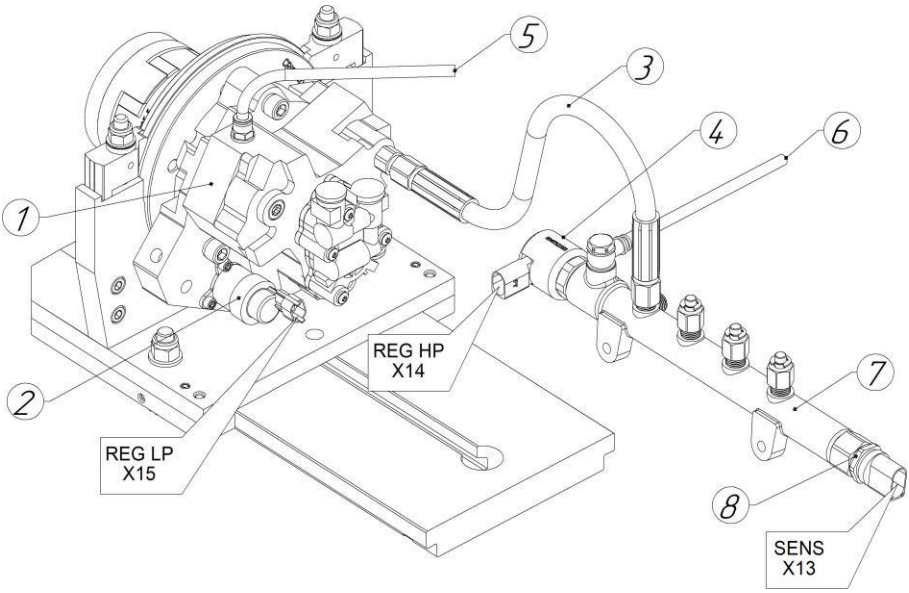


Figure 6.Pump and rail connection diagram

Position	Description
1	Pump under test;
2	Metering valve;
3	High-pressure tube;
4	High pressure regulator in the rail;
5	Pump backflow preventer;
6	Back drain from the pressure regulator;
7	The accumulation rail;
8	High pressure sensor in the rail.

7. Hydraulic pump connection to meter

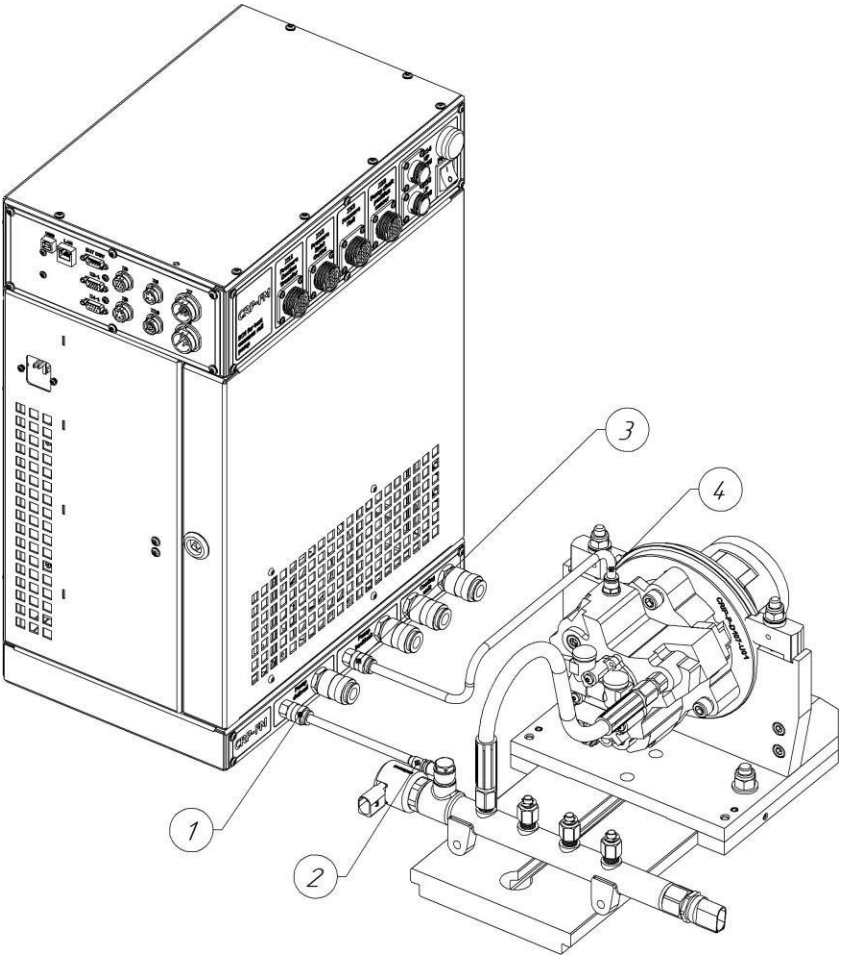


Figure 7.Hydraulic connection of the pump to the meter

Position	Descriptio n
1	Feed measurement input of the pump under test;
2	Back drain from the pressure regulator;
3	Backflow measurement input of the pump under test;
4	Pump backflow preventer.

8. Hydraulic connection of the meter to

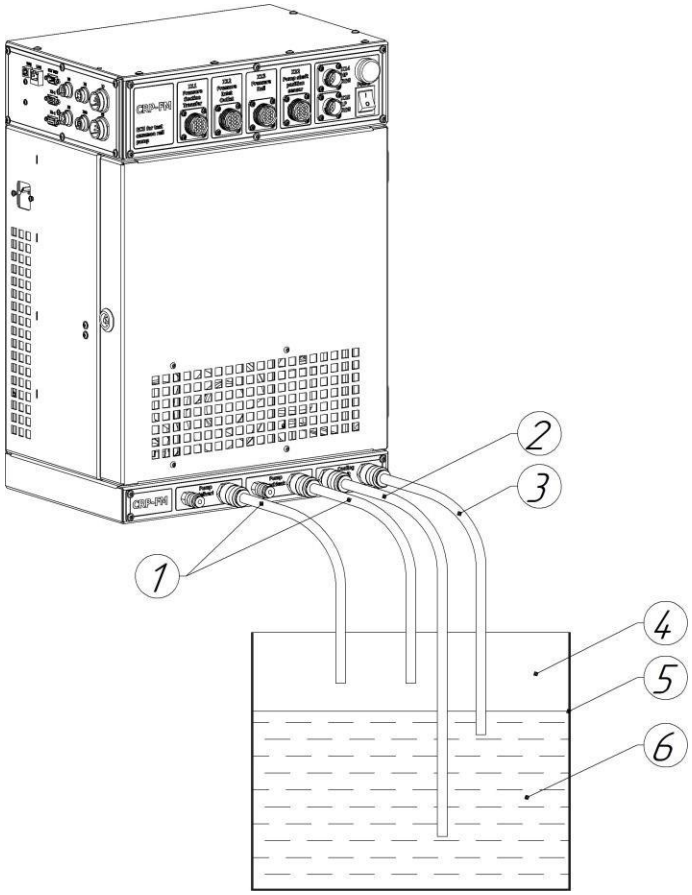


Figure 8.Hydraulic connection of the meter to the test bench

Position	Description
1	Drain the measured liquid back into the tank;
2	Cooling system pump inlet;
3	Back draining of the cooling system;
4	Bench tank for test fluid;
5	Maximum level of the test liquid;
6	Test fluid ISO 4113.

9. Restrictions on the connection of the measured return flow liquids

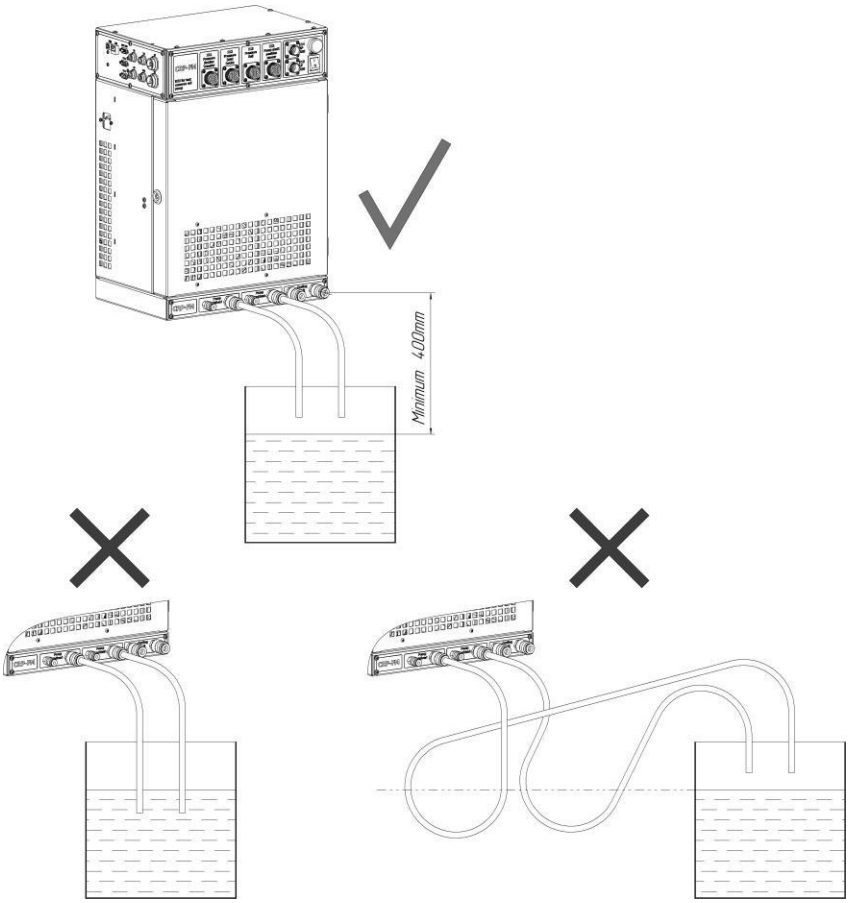


Figure 9.Restrictions on the connection of the measured liquid return flow

To ensure correct operation of the liquid measurement system, the measured liquid must be freely drained back into the test bench tank.

The measuring unit must be above the tank. The measured liquid must enter the tank above the liquid level in the tank. The drain hose must not be kinked and the drain hose must not be submerged in the layer of test liquid.

Appendix No. 3 Connector pinout X3- 1

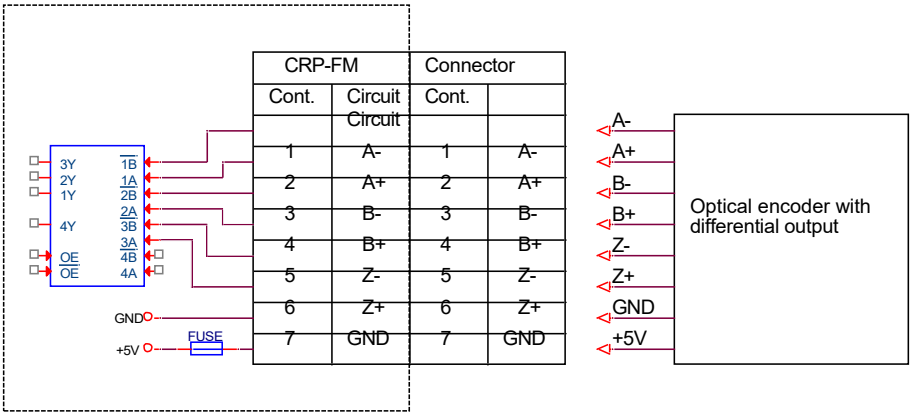


Figure 10.Encoder connection connector

Appendix No. 4 Connector pinout X4- 1

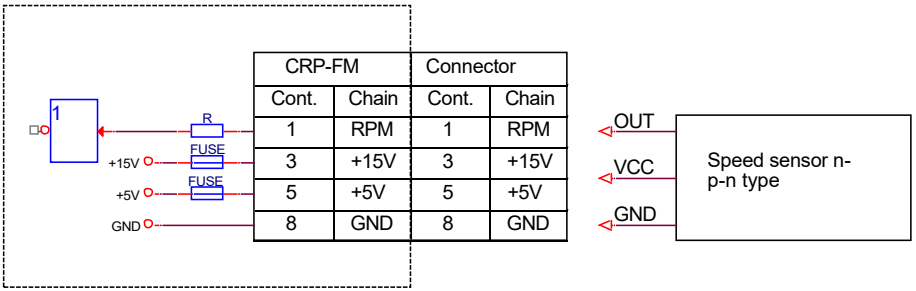
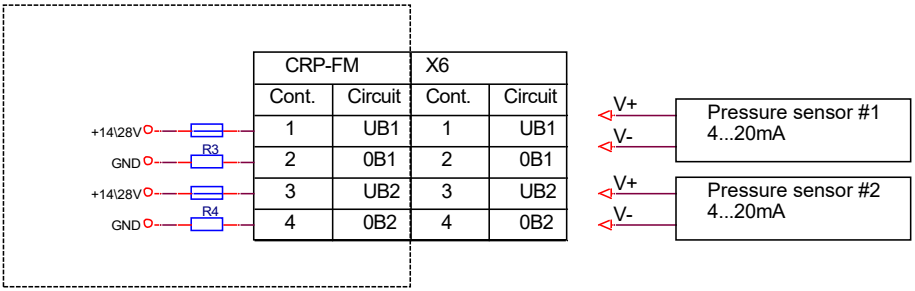


Figure 11.Speed sensor connection socket

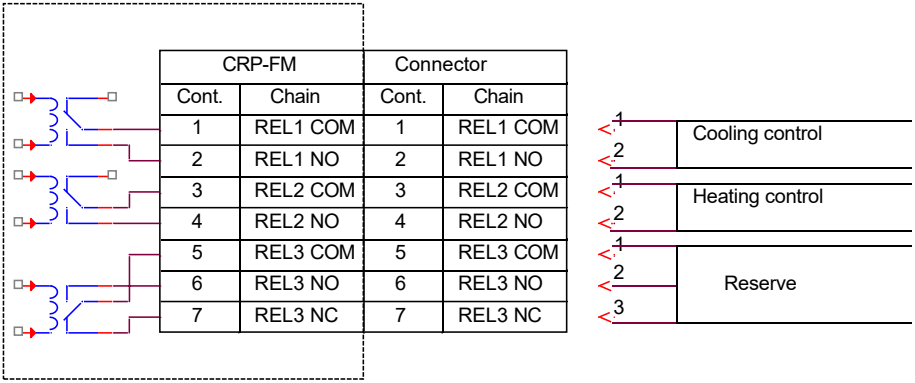
Appendix No. 5 Connector pinout X6



CRP-FM		X6	
Cont.	Circuit	Cont.	Circuit
1	UB1	1	UB1
2	0B1	2	0B1
3	UB2	3	UB2
4	0B2	4	0B2

Figure 12.Sensor connection socket with 4-20mA output

Appendix No. 6 Connector pinout X7



CRP-FM		Connector	
Cont.	Chain	Cont.	Chain
1	REL1 COM	1	REL1 COM
2	REL1 NO	2	REL1 NO
3	REL2 COM	3	REL2 COM
4	REL2 NO	4	REL2 NO
5	REL3 COM	5	REL3 COM
6	REL3 NO	6	REL3 NO
7	REL3 NC	7	REL3 NC

Figure 13.Burner control/cooling connection

Appendix No. 7 Connector pinout X8

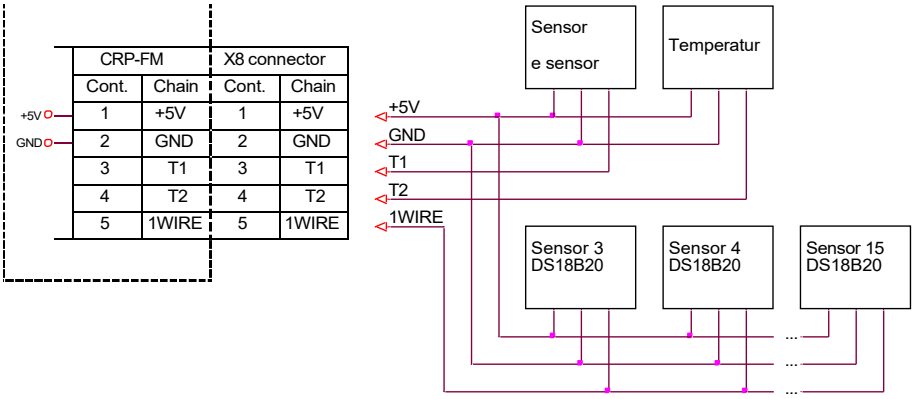


Figure 14.Temperature sensor connector

Appendix No. 8 Connector pinout X9

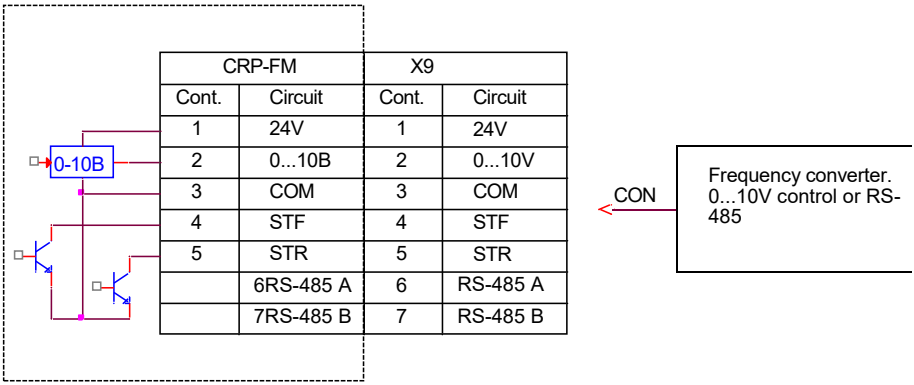
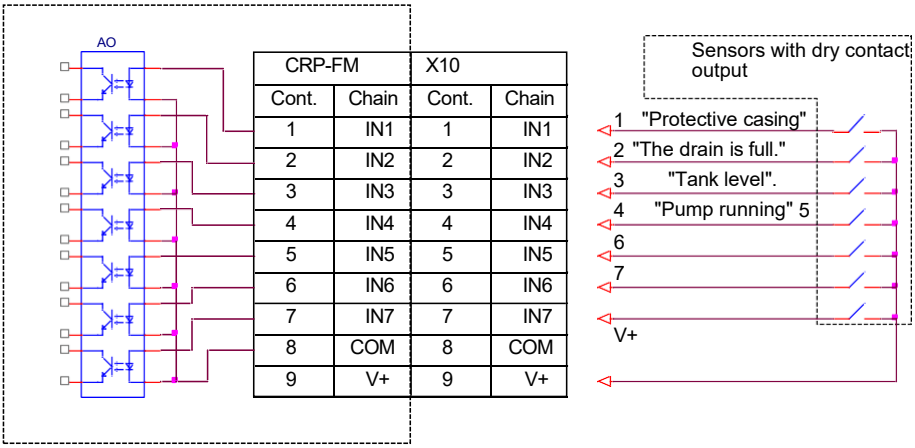


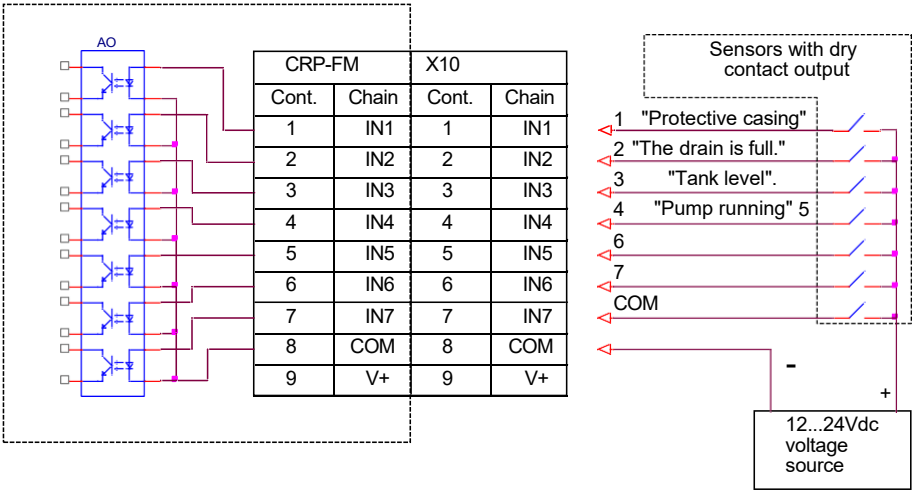
Figure 15.Frequency converter connection socket

Appendix No. 9 Connector pinout X10



CRP-FM		X10	
Cont.	Chain	Cont.	Chain
1	IN1	1	IN1
2	IN2	2	IN2
3	IN3	3	IN3
4	IN4	4	IN4
5	IN5	5	IN5
6	IN6	6	IN6
7	IN7	7	IN7
8	COM	8	COM
9	V+	9	V+

Figure 16.Connector for connecting actuator sensors.
Option of using the internal sensor supply.



CRP-FM		X10	
Cont.	Chain	Cont.	Chain
1	IN1	1	IN1
2	IN2	2	IN2
3	IN3	3	IN3
4	IN4	4	IN4
5	IN5	5	IN5
6	IN6	6	IN6
7	IN7	7	IN7
8	COM	8	COM
9	V+	9	V+

Figure 17.Connector for connecting actuator sensors.
Option of using an external sensor power supply.

Appendix No. 10 Connector pinout X11

CRP-FM		Connector X11	
Cont.	Chain	Cont.	Chain
4	+5V	4	+5V
5	GND	5	GND
6	PR suction U	6	PR suction U
8	+5V	8	+5V
9	GND	9	GND
10	PR transfer U	10	PR transfer U
11	PR transfer I	11	PR transfer I
12	+15V	12	+15V
14	PR suction I	14	PR suction I
1	+15V	1	+15V

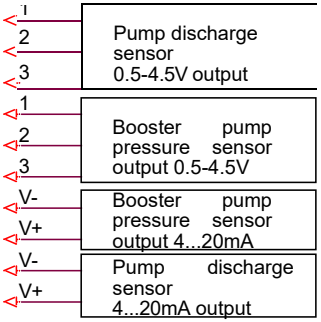


Figure 18.Connector X11, supply pump pressure measurement and vacuum system measurement of the pump under test

Appendix No. 11 Connector pinout X12

CRP-FM		X12 connector	
Cont.	Chain	Cont.	Chain
3	NTC overflow	3	NTC overflow
4	+5V	4	+5V
5	GND	5	GND
6	PR outlet U	6	PR outlet U
7	NTC inlet	8	NTC inlet
8	+5V	8	+5V
9	GND	9	GND
10	PR inlet U	10	PR inlet U
12	+15V	12	+15V
2	DT Pump	2	DT Pump
14	GND	14	GND

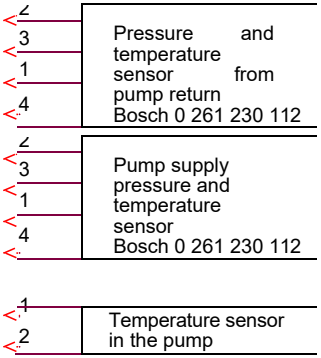


Figure 19.Connector X12, pump inlet pressure measurement and return line pressure of the pump under test

Appendix No. 12 Connector pinout X13

CRP-FM		Connector X13	
Cont.	Chain	Cont.	Chain
4	+5V	4	+5V
5	GND	5	GND
6	PR 2500 U	6	PR 2500 U
8	+5V	8	+5V
9	GND	9	GND
10	PR 1800 U	10	PR 1800 U
11	PR 2500 I	11	PR 2500 I
12	+15V	12	+15V
13	DT Rail	13	DT Rail
14	GND	14	GND

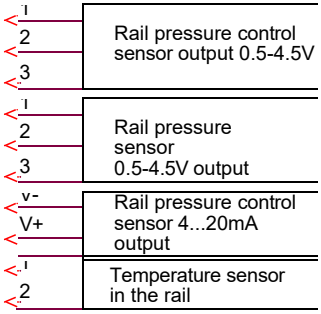


Figure 20.Connector X13, high rail pressure measurement

Appendix No. 13 Connector pinout X22

CRP-FM		Connector X22	
Cont.	Chain	Cont.	Chain
1	RPM pump	1	RPM pump
5	RPM pump I	5	RPM pump I
8	+5V	8	+5V
9	GND	9	GND
12	+15V	12	+15V
10	Sens +	10	Sens +
11	Sens -	11	Sens -

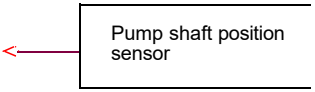


Figure 21.Connector X22, shaft position sensor for pump under test

Appendix No. 12 Connector pinout X14

CRP-FM		Connector X14	
Cont.	Chain	Cont.	Chain
1	REG HP1+	1	REG LP1+
2	REG HP1-	2	REG LP1-
3	REG HP2+	3	REG HP2+
4	REG HP2-	4	REG HP2-
5	REG HP3+	5	REG HP3+
6	REG HP3-	6	REG HP3-

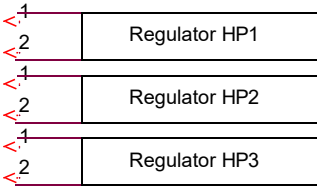


Figure 22. Connector X14, rail pressure regulator control outputs

Appendix No. 13 Connector pinout X15

CRP-FM		Connector X15	
Cont.	Chain	Cont.	Chain
1	REG LP1+	1	REG LP1+
2	REG LP1-	2	REG LP1-
3	REG LP2+	3	REG LP2+
4	REG LP2-.	4	REG LP2-.

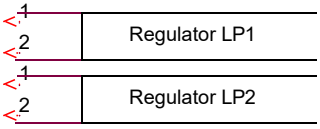


Figure 23. Connector X15, pump controller valve control outputs

10. Dimensions

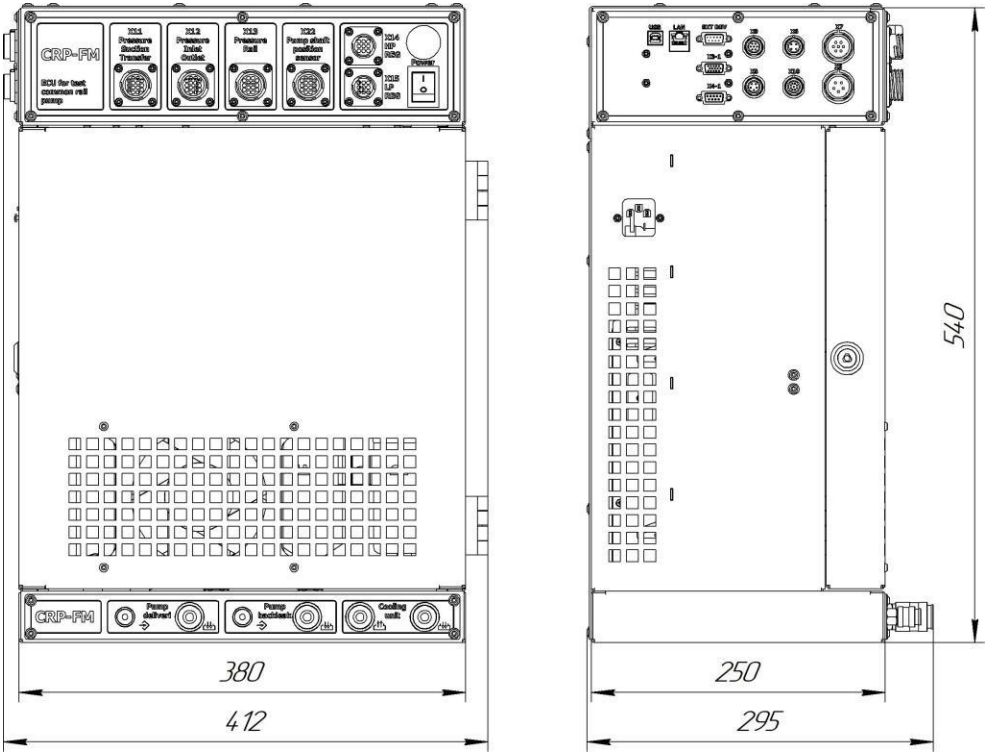


Figure 24.Overall dimensions

11. Mounting dimensions

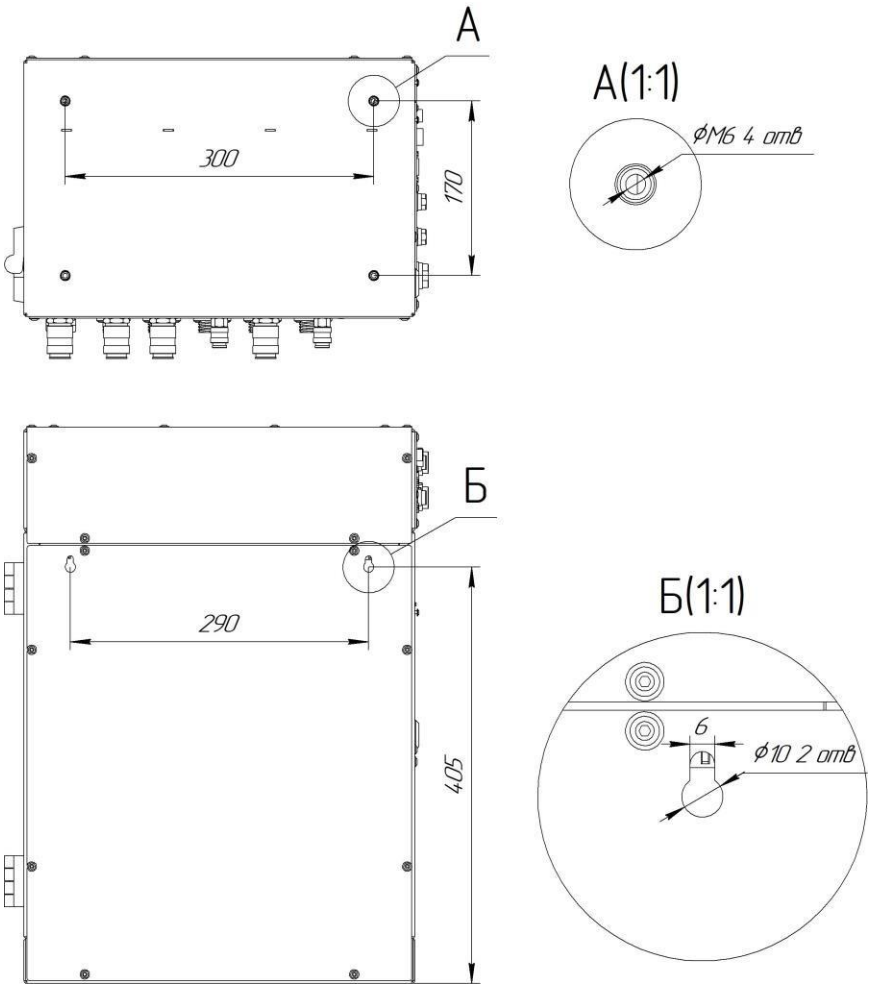


Figure 25.Mounting dimensions

The measuring unit can be mounted on a horizontal or vertical surface. There are mounting holes in the bottom of the enclosure and on the rear wall for this purpose.

During operation, the unit must be securely fastened and protected from vibration caused by the operation of the test bench equipment.