

## Overview

The RAYA Flowcomputer is designed specifically for hydrocarbon liquid and gas measurement with high accuracy and reliability. This Flowcomputer Supports differential pressure , linear meter runs and pulse base meters.

Compatible different calculation standards:

- API Chapter 21.1
- API Chapter 14.3, AGA 3, AGA 5, AGA 7, ISO 5167
- AGA 8, AGA 9
- EN 12405 – 3

The RAYA Offers flexible I/O and superior data collection with a wide range of connectivity options like Modbus TCP and Modbus RTU.

All metering calculations are performed using 64-bit (double) precision floating point numbers for the highest accuracy and API compliance.

Data logging supports local storage and Exclusive online monitoring UI that save data on both online and offline mode for a long time and data loss will not occurs at all.

The RAYA includes a 5 Inches touch HMI. The HMI on the RAYA enable you to review or modify system parameters without the need for a PC.





## Features

- Low cost, high reliability design
- 240MHz Kinetis FreeScale ARM Cortex M7 microprocessor
- Integrated Ethernet 10/100 Base-Tport with specific Modbus Protocol
- Four independent Serial RS-232/RS-485 for GC and USM and DCS applications
- Micro SD Card capability(future non-volatile memory expansion)
- Significant resistance against over-current / transients
- Aluminum enclosure
- AC / DC power supply capability
- High accuracy temperature measurement including curve matching via the Callendar-Van Dusen & 5th polynomial equation
- Increased measurement reliability
- Flexible design with configurable I/O and communication ports
- Standard firmware supports Properties Calculations for Natural Gas , global calculations for orifice meters and general calculation for pulse meters.
- Simple selection of engineering units to suit local requirements
- QSPI flash for audit/trail & data logging
- Specific User Interface with online data trend and csv output file

## Applications

The standard features of the RAYA make it ideal for the following applications:

- Flow measurement at Power stations
- Flow measurement at C.G.S & T.B.S and monitoring stations
- Meter proving applications
- Pipeline measurement
- Fiscal flow measurement



CPU Module		
Processor	NXP / Kinetis FreeScale	ARM cortex-M7
Ex Memory	128 Mb	QSPI Flash
Clock frequency	240 MHz	External OSC + PLL
Watchdog	Supply voltage and Clock supervisory	1.6 sec Reset window

### Calculations

Compliances & Certificates	API MPMS CHAPTER 21.1: SECOND EDITION, FEBRUARY 2013 BS EN 12405-3:2015 API MPMS CHAPTER 21.2: FIRST EDITION, AUGUST 2000	
Orifice meter	AGA Report No.3: 1990 - 2012 ISO 5167-2: 2003 API 14.3: FOURTH EDITION, OCTOBER 2019	
Ultrasonic Meter	AGA 9: Third Edition July 2017	
Compressibility factor	AGA 8 (full gas composition Detail Equation) Fixed Z PTZ compensation	
Calorific value & Energy	ISO 6976: Third edition 2016-08-15 BS EN 12405-2: 2012	
Correction factor for liquids	API MPMS CHAPTER 11.1: MAY 2004	
Compressibility Factors for Hydrocarbons	API MPMS CHAPTER 11.2.1: 1984 API MPMS CHAPTER 11.2.2: 1986 API MPMS CHAPTER 11.2.3: 1984	
Correction factor for LNP & LPG	API MPMS CHAPTER 11.2.4: SEPTEMBER 2007	
Calculation of Petroleum Quantities	API MPMS CHAPTER 12.2.1: SECOND EDITION, MAY 1995 API MPMS CHAPTER 12.2.2: THIRD EDITION, JUNE 2003 API MPMS CHAPTER 12.2.3: FIRST EDITION, OCTOBER 1998 API MPMS CHAPTER 12.2.4: FIRST EDITION, DECEMBER 1997 API MPMS CHAPTER 12.2.5: FIRST EDITION, SEPTEMBER 2001	

### Communications

Ethernet	Modbus / TCP 10 – 100 Mb/s	Software / SCADA
RS485/422 x 2	Modbus RTU/ASCII	GC / DCS / USM
RS232	Modbus RTU/ASCII	PLC / DCS / SCADA

### Data Logging

Online	GUI	Not limited - CSV file output Selectable time base
Offline	QSPI Flash	Up to 10 year at 1s sampling rate
	HMI QSPI Flash	Up to 10 year at 1s sampling rate
	SD CARD	4 GB to 32 GB

## Inputs / Outputs

Analog inputs		FC230200	FC233500
	Type	4 - 20 mA	4 - 20 mA/HART
	Overall range	0 - 24 mA	
	No of channels	3	6
	Configuration	2 / 4 Wire	2 Wire
	Resolution	16 Bit	
	Conversion time	10 mS	
	Calibration	10 Seconds Cyclice Auto Calibration Software Manual Calibration by GUI	
	Hardware low-pass filter Software selectable filter	50Hz / 400Hz	
	Input impedance	135 Ohm	250 Ohm
	Accuracy	0.05 % FSR at 25 °C	
	Temperature Effect	±25 ppm (0 to 50 °C)	
	Isolation	Optically isolated from MCU <sup>(1)</sup>	

## Inputs / Outputs

RTD temp sensor input	Type	2 / 3 / 4 Wire Software selectable
	PRT (RTD)	PT100 / PT1000 Software selectable
	Calculation	Callender-Van Dusen ( for T>0 °C ) Polynomial 5th order ( for T<0 °C )
	Resolution	15 Bit
	Accuracy	PT100 / PT1000 Software selectable
	Fault detection unit	RTD short/open circuit RTD over range Measurement circuit Error
Turbine Frequency inputs	Type	Magnetic pickup Hall effect digital pulse
	Signal level (magnetic)	200mVp-p to 60Vp-p
	Signal level (Hall effect)	0 – 24VDC

(1) There is no Isolation between the channels.



	Frequency range	LF 0 to 10 Hz HF 10 Hz to 35 KHz
	Accuracy	LF 0.01% FS HF 0.1% FS
	Resolution	15 nS
	Input impedance	>80 Kohm (Magnetic ) >2.2Kohm (Digital pulse)
	Other features	Hardware low-pass filter ESD protection Internal voltage clamp Optically isolated
	Digital inputs	Type
	No of channels	Based on customer requerments
	Input range	0 – 24V
	Max input voltage	35V
	On state voltage	> 12V
	Off state voltage	< 9V
	Frequency range	0 – 5KHz
	Isolation	Optically isolated
	Input impedance	>2 Kohm
	Protections	Reverse voltage Overvoltage ESD
Digital outputs	Type	Open Collector / Emitter
	No of channels	3
	Frequency range	0 to 5 KHz
	Supply Voltage	External Max 50VDC
	Output current	300mA (Internal fuse)
	Isolation	Optically isolated
	High output level	VCC – 1.2 V
	Low output level	0 V
	Special function	1 Digital output as Total flow output pulse (DOI)
Mechanical relays	No of relays	2
	Function	Power supply status Optional alarm status

	Contacts	NO Contacts 5A 220VAC 20VDC
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### Power supply

Supply voltage	AC mode: 85 to 265 V Universal range	DC mode: 18 - 36 VDC
	Power consumption	10 W
Protection	2 x 2A fuse in series	EX.i standard
Inrush current	Thermistor	
EMI filter	Common mode and Differential mode	
Input power fail flag (Relay off)	Around 15V	
Output voltages	24VDC / 1A – Field power supply _ 9VDC / 1A – MCU power supply	9VDC / 0.8A – Field circuits supply

### Physical

Enclosure	Painted aluminum case with front glass panel	
	IP67 Classification	
Dimensions	250×190×90 mm	
Weight	4 Kg	
Display	Graphical display	LCD TFT 5 inch 800x400 pixels
	Touch	Resistive touch
	LED indicators	3 (Power / Alarm / Warnin)
	Language	English

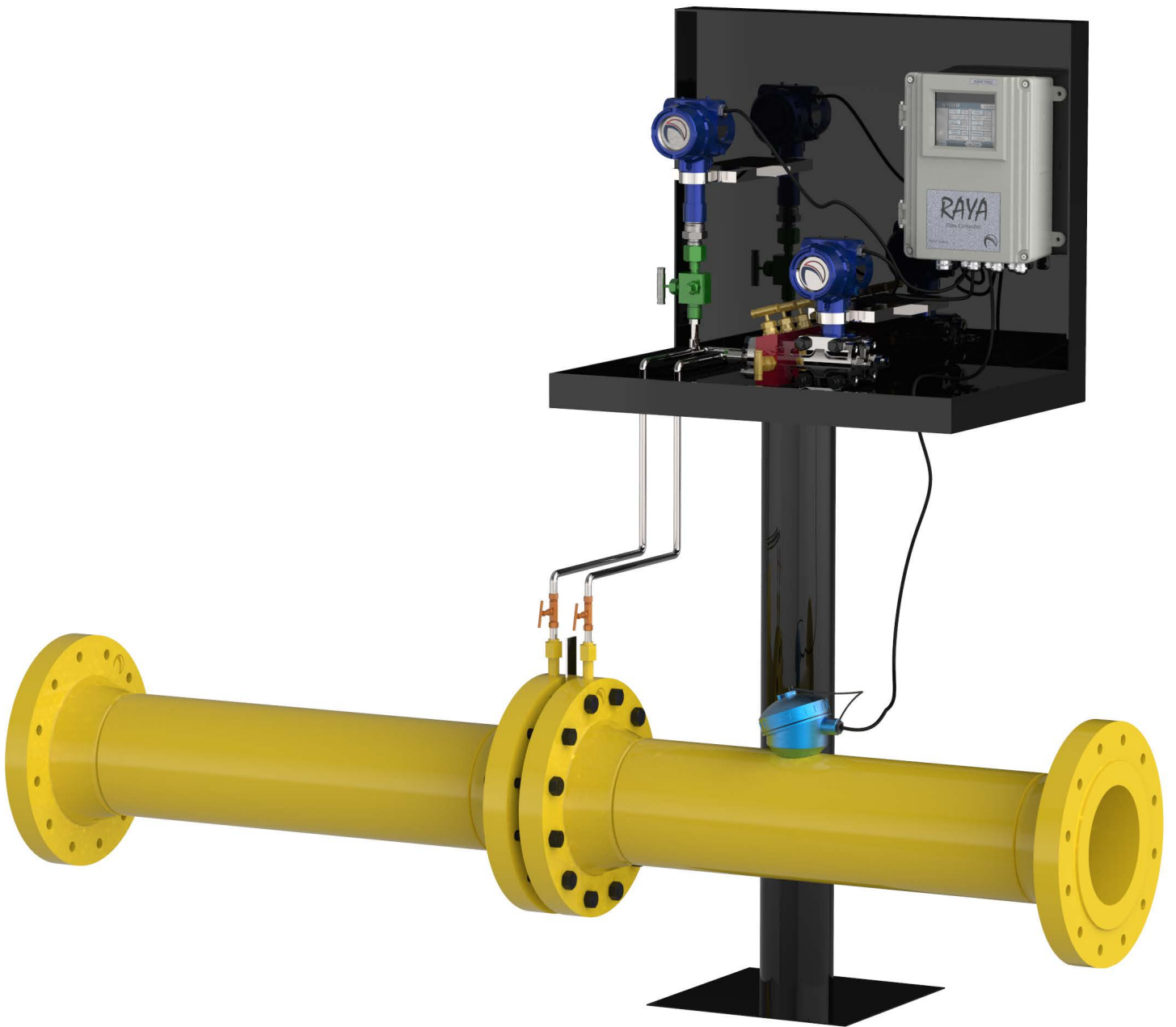
### Environmental

Operating Temp	-20 to 50 °C	
Storage Temp	-30 to 75 °C	
Humidity	<90%	
Conformal coating	All PCBs are coated based on EX.i standards	
Safety Classification	ATEX – ZONE 2 – OUTDOORFC	

### Approvals

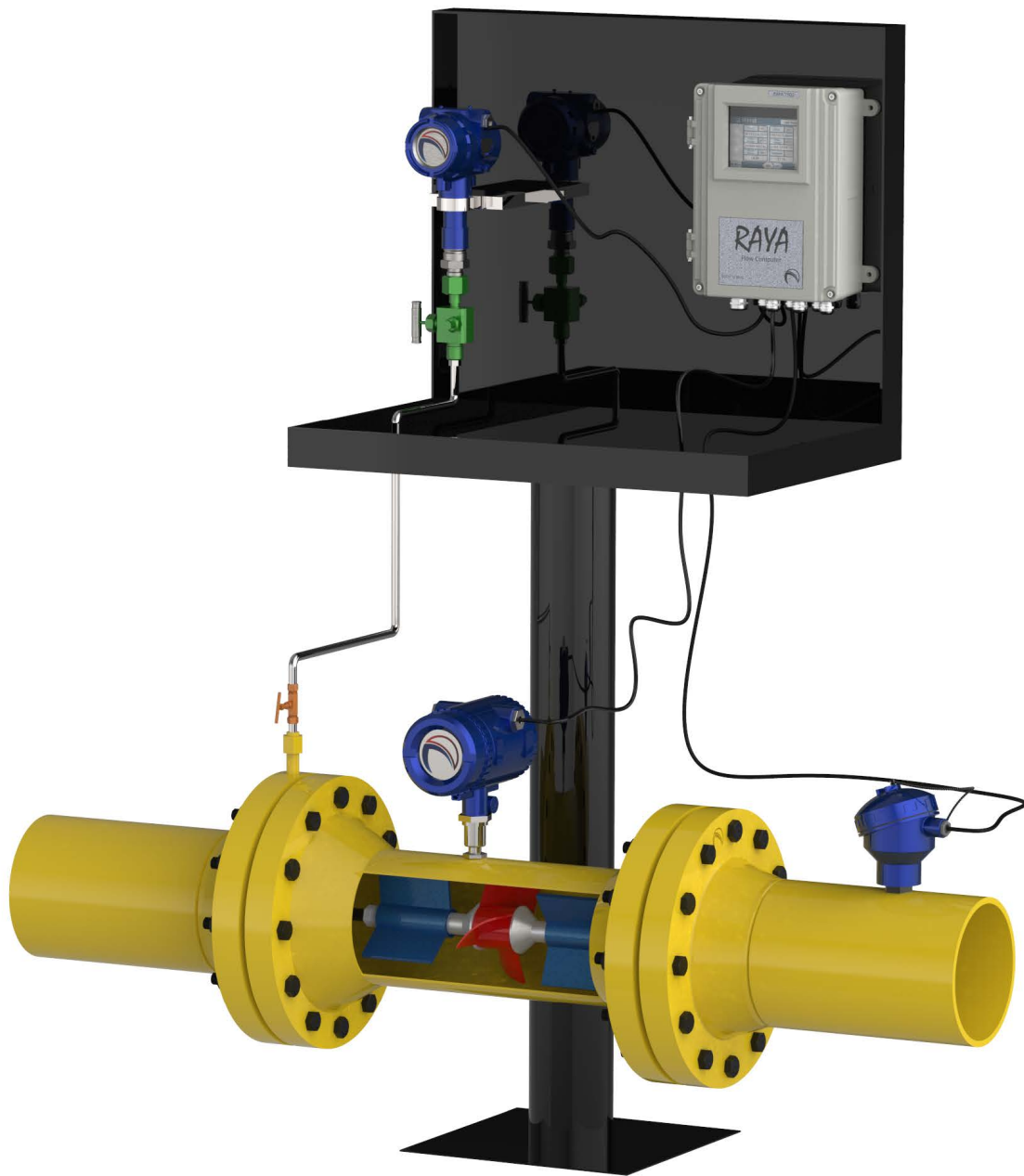
Design standards	IEC61000-2 IEC61000-4 IEC61000-6 EX.i(a,b) EX.m(a,b)	ESD / EMC / EMI Surge
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## Orifice Installation



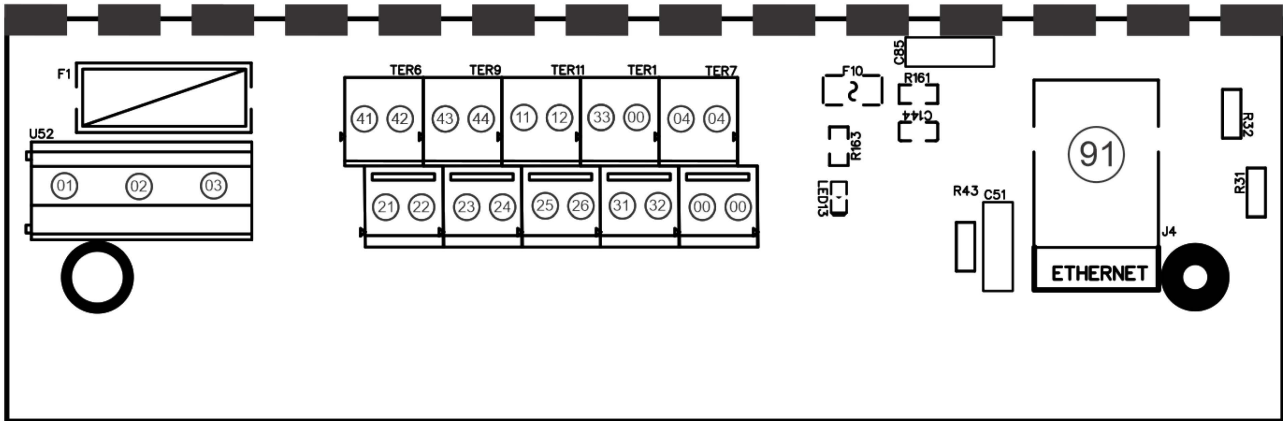


## Turbine Installation



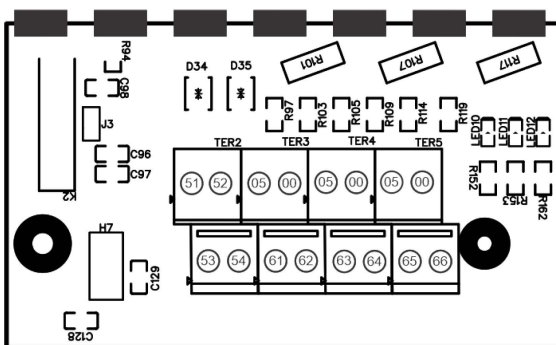
## Terminal of FC-230200

### Main board



- 00. GND - Field power ground
- 01. ERTH - Chassis connection
- 02. AC Power supply input
- 03. AC Power supply input
- 04. 24 VDC Field power supply output
- 11. Digital input 1
- 12. Digital input 2
- 21. Digital output 1 collector
- 22. Digital output 1 Emitter
- 23. Digital output 2 collector
- 24. Digital output 2 Emitter
- 25. Digital output 3 collector
- 26. Digital output 3 Emitter
- 31. Magnetic pickup input (+)
- 32. Magnetic pickup input (-)
- 33. Digital pickup input
- 41. Alarm relay NO contact
- 42. Alarm relay COM contact
- 43. Power status relay NO contact
- 44. Power status relay COM contact
- 91. Ethernet modbus TCP/IP socket

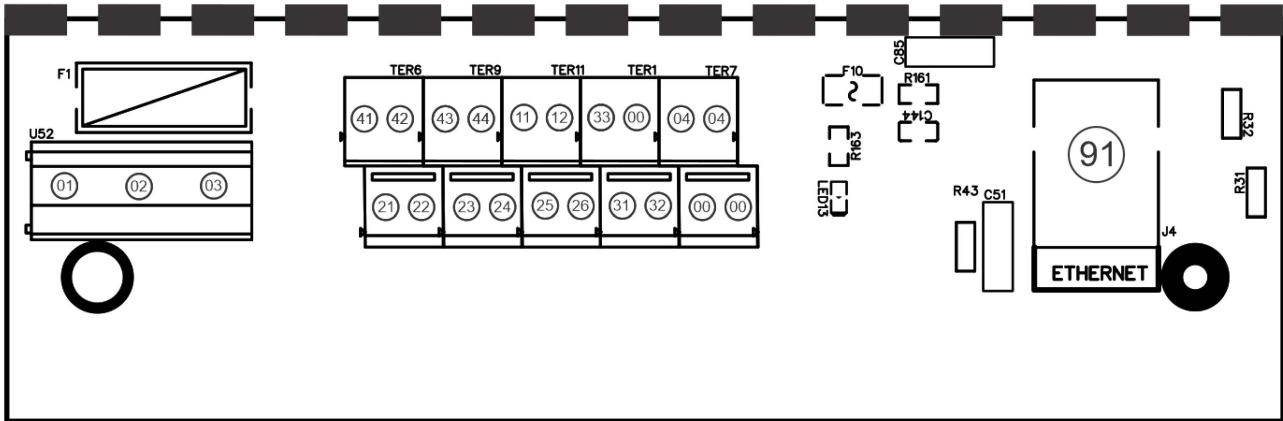
### Analoge board



- 00. GND - Field power ground
- 05. Transmitter power supply
- 51. RTD PT100/PT1000 current output
- 52. RTD PT100/PT1000 voltage input (+)
- 53. RTD PT100/PT1000 current input
- 54. RTD PT100/PT1000 voltage input (-)
- 61. 4mA-20mA analog input 1 (+)
- 62. 4mA-20mA analog input 1 (-)
- 63. 4mA-20mA analog input 2 (+)
- 64. 4mA-20mA analog input 2 (-)
- 65. 4mA-20mA analog input 3 (+)
- 66. 4mA-20mA analog input 3 (-)

## Terminal of FC-233500

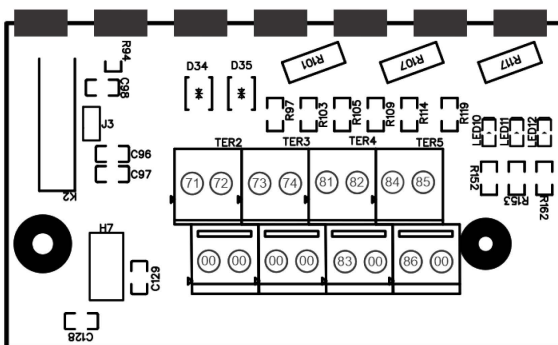
### Main board



- 00. GND - Field power ground
- 01. EARTH - Chassis connection
- 02. AC Power supply input
- 03. AC Power supply input
- 04. 24 VDC Field power supply output
- 11. Digital input 1
- 12. Digital input 2
- 21. Digital output 1 collector
- 22. Digital output 1 Emitter
- 23. Digital output 2 collector
- 24. Digital output 2 Emitter

- 25. Digital output 3 collector
- 26. Digital output 3 Emitter
- 31. Magnetic pickup input (+)
- 32. Magnetic pickup input (-)
- 33. Digital pickup input
- 41. Alarm relay NO contact
- 42. Alarm relay COM contact
- 43. Power status relay NO contact
- 44. Power status relay COM contact
- 91. Ethernet modbus TCP/IP socket

### Analoge board



- 00. GND - Field power ground
- 71. 4mA-20mA / 0-10 V analog output 1
- 72. 4mA-20mA / 0-10 V analog output 2
- 73. 4mA-20mA / 0-10 V analog output 3
- 74. 4mA-20mA / 0-10 V analog output 4
- 81. 4mA-20mA / HART transmitter input 1
- 82. 4mA-20mA / HART transmitter input 2
- 83. 4mA-20mA / HART transmitter input 3
- 84. 4mA-20mA / HART transmitter input 4
- 85. 4mA-20mA / HART transmitter input 5
- 86. 4mA-20mA / HART transmitter input 6



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