USER AND MAINTENANCE MANUAL

PROJECT

FUEL CONSUMPTION MEASUREMENT SYSTEM

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

Dear User,

Neometrix is grateful for this opportunity provided to us to offer our products & services to you. We sincerely hope that you will be delighted to use our system and give us more opportunities to serve you.

Neometrix is very focused on Aviation and Railway industries and offers complete range of systems & services which can be of immense use to you. We specialize in Hydraulic/ Servo Hydraulic Test Rigs, Fuel System Test Rigs, Pneumatic System Test Rigs, Oxygen/ Special Gases system Test Rigs, Very High Pressure Systems, Electronic & Electrical Test Rigs. Our services include among others, the followings:

- State of the art Test Rig Design, Development, Fabrication, Installation, Commissioning, Training & Support.
- Refurbishment/ Up gradation of the Existing Test Rigs.
- Maintenance (AMC) contracts of Existing Test Rigs.
- Operations Contract for the Test Rigs.
- Setting up of complete Testing Infrastructure including civil infrastructure.

Neometrix is committed to offer its best solutions & services to you all the times and wish to become your preferred supplier for these services.

With Best Regards,

Shailendra Pratap Singh
CEO

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

INDEX

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

Chapter 1

Chapter 1 .1 Do's & Do not's for the System:

Do:

- ✓ Read the User Manual in detail before operating the System.
- ✓ Check that all the manual valve of the system are open when the system is in operation.
- ✓ As certain what tools and equipment are required to carry out the job.
- ✓ Use proper tools to suit the job and avoid unnecessary dismantling.
- ✓ Ensure that all nuts, screws, pipe connectors and covers are properly tightened.
- ✓ Check the proper grounding of the system before operating.
- ✓ Check all the supplies voltage.
- ✓ Make sure the coupling is tight before operating.
- ✓ There should be no loose wiring and all the naked contacts are well insulated.
- ✓ All the power supplies are in operation mode before running the application.
- ✓ Make sure all rotating elements are covered.
- ✓ Insulate electrical (internal and external) motor connections.

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

- ✓ In case of high vibration in the system immediately shut down the testing.
- ✓ Before starting the test ensure proper mounting of the motor with the shaft.
- ✓ Only trained/qualified service personnel are authorized to service the unit.
- ✓ Connect the unit only to the recommended mains sockets.
- ✓ Take extra care while installing or removing the cables.
- ✓ Turn off the main MCB of the power supply when not to be used for a long time.

Chapter 1 .2 Do Not:

- × Do not touch the sensors or their mountings.
- × Do not touch any wire inside the panel.
- × Do not run the machine without opening of manual valve.
- × Do not touch any rotating part when in operation.
- × Do not put anything in the front of cooler blower.
- × Do not put the system in irregular surface.

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

- Do not change the readings of electrical instrument i.e **RTD, load cell.**
- Do not run the motor/start test if the mounting bolts/fasteners are loose.
- Do not tamper with the power supply trim pots as this may lead to change in voltage levels and damage expensive components.
- Do not open the door of panel without turning OFF the main MCB.
- Do not increase the voltage level of the power supply beyond the rated voltage of the test motor.
- Do not operate the system with wet hands.
- Do not pull the wires coming out of the test bench.
- Do not start the test sequence without the coupling the motor with the shaft.
- Do not tamper or change the wiring without the presence of trained NEOMETRIX Personnel as this may lead to unwanted results and also damage the components.

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

Chapter 2.0

Warnings:

- Make sure that all electronic products are earth-grounded, to ensure Personal safety and proper operation.

- All sensors are that is RTD and all the very sensitive; please never try to touch them.

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

Legends & Abbreviations

FCMS	**Fuel Consumption Measurement System**
TWS	Tank Weighing System
MT	Mettler Toledo
CP	Control Panel
EM	Emergency
MinFTM	MIN Fuel Tank Mass
MaxFTM	MAX Fuel Tank Mass
O/L	Over Load
FBK	Feedback
RTD	Resistance Temperature Detectors
PT	Platinum Resistance
HMI	Human Machine Interface
HSD	High Speed Diesel
PLC	Programmable Logic Controller
DACS	Data Acquisition & Control System
PCB	Printed Circuit Board
CS	Cast Steel

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

Chapter 03

DESCRIPTION OF

FUEL CONSUMPTION MEASURMENT SYSTEM

(PROJECT NO. A1738)

Fuel Consumption measurement System(FCS) is a self-contained SKID housing Fuel Tank, Tank Weighing System (TWS) of Mettler Toledo (Model No. IND 570), Fuel Tank Filling Pumps/Flame Proof Motor, Temperature Sensors (RTD), Shell & Tube Type Heat Exchangers for cooling of Fuel and a **Control Panel (CP)** for user to interact with the system. All electronic/software controls & communication interaction with the **FCS SKID** is through this **CP**. The FCS has following equipments/instruments which have electronic interfaces:

1- The Ball Valve at the suction of the Fuel Tank Filling Pump (1.0) is MANUAL and has a **limit switch** which tells that this Valve is Open. The Fuel Tank Filling Pump/Motor shall start only if this Valve (1.0) is Open.
2- Three Phase Flame Proof 1.5 kW Electric Motor (3.0) for operating Fuel Tank Filling Pump.
3- Filter Clogging Indicator Switch (6.0) which indicates that the Filter is clogged.
4- Float Switches (22.1) and (22.2) get activated in case of Fuel Tank overfill or Fuel Tank over flow.
5- The Electrically operated Ball Valve at the outlet of Fuel Tank Filling Pump (7.0) is operated from PLC Control/ GE DACS and also it has a Limit Switch, which gives signal when this Valve is OPEN. This Valve is installed closest to the Fuel Tank to minimize the fuel dripping time.

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

6- Tank Weighing System (TWS) comprising of 4 Load Cells, Flameproof Junction Box & IND 570 Indicator (Make: Mettler Toledo (MT).
7- Fuel Temperature Control Valves (10.1 & 10.2) on the Chilled water line coming from Refrigerated Chiller to Shell & Tube Heat Exchangers. The Valve (10.1) controls the Fuel Temperature at 85+/-5 Degree F. The Valve (10.2) cools the power return line Fuel to 118 Degree F.
8- Temperature Sensors (RTD) (8.1, 8.2, 8.3, 8.4, 8.5, and 8.6) installed to monitor the temperature of chilled water as well as the fuel.
9- The Control Panel also controls the ON/OFF operation of Chiller through RS485 communication between Chiller & PLC controller inside CP.

The **Control Panel (CP)** which is a powder coated metallic box of size (700X650X350) installed on the TSFCS SKID houses a **PLC Controller and a HMI (Human Machine Interface) along with Emergency Switch and a Tower Light.** It also houses the Mettler Toledo Controller/Indicator (IND 570). All the Sensors are wired with the PLC I/O ports of the PLC Controller as explained in the referenced Electrical Circuit Drawings. The PLC Controller is connected with the followings:

- PLC Controller is connected with Temperature Sensors (8.1, 8.2, 8.3, 8.4, 8.5, and 8.6), Limit Switches on Valves (1.0, 7.0) and Filter Clogging Indicator Switches on filters (6.0) and also Float Switched (22.1, 22.2).
- PLC Controller is connected with Mettler Toledo (MT) Tank Weighing System (TWS) - IND 570 through RS 485 Port (Protocol: RS 485 MODBUS RTU). RS 485 MODBUS RTU will communicate the current MASS of the Fuel Tank (Tank Mass + Fuel inside Tank Mass) always to the PLC controller. This Data of the current MASS of the Fuel Tank will always be available to the Customer's GE DACS through Ethernet Port available in Control Panel (**CP**). Rest of the Mettler Toledo Tank Weighing System (TWS) features can be operated from the IND 570 available on Control Panel (CP). These operations are like: Calibration of the Tank Weighing System etc. **Please note that**

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

PLC Controller is sending only the current MASS of the Fuel Tank to GE DACS.

- PLC Controller is also connected with Chiller through RS485 for its ON/OFF operation.
- The Control Panel is connected with GE DACS system through Ethernet cable.
- The HMI on control panel will always show the current status (Open/Close, On/Off) of all components in the Fuel Circuit.

Various Operations are performed on TSFCS as follows:

1- Fuel Tank Filling Operation
2- Loco Test Run Operation
3- Emergency Shut Down Operation
4- Tank Weighing System (TWS) Calibration

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

Chapter: 4
Introduction

FUEL CONSUMPTION MEASUREMENT SYSTEM is a test bench to test the fuel consumption of locomotives .SS Tank of 150 Liters supplies the fuel to the **TEST ENGINE** through pump & filtration system.

This TANK is put on a set of 4 Load cells (4 Legs of the Tank). The load Cells carry the signal mV/V to the flame proof junction box and then to the Mettler IND570 Panel Mount. Fuel Consumption Measuring System is actually the load cells continuously measuring the TANK Fuel mass. As the fuel is getting consumed the Tank mass keeps reducing and the same is monitored. The fuel is pumped using a Pump with Flame Proof Motor and through one stage of finest filtering unit of 10 micron which also have clogging indicator. The filtered fuel is feed to the system to maintain a constant pressure of **0.3 to 0.5 Bar at the Inlet of the .** For maintaining constant pressure a relief valve is put in the system.

The flow measurement (actual real time fuel consumption measurement) is done through fuel being consumed from the TANK using LOAD CELL system. Fuel is allowed to flow through the Output point (loco suction) of the system for the supply of fuel to the engine.

SS tank(12.0) of 220 Lit. capacity with usable volume 150 lit. supplies the fuel to the TEST ENGINE through pump(4.0) & filtration system(6.0).
This tank is put on a set of 4 load cells as the have is mounted over 4 legs. The load cell (18.0) carry the signal mV/V to the flame proof junction box and then to the Mettler IND570 Panel Mount. As the fuel is getting consumed the tank mass keep on reducing and the same is monitored. The fuel is supplied to the system by LOCO tank. Fuel is

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

pumped using a pump with Flame proof motor (3.0) and through the finest filtering unit of 10 micron absolute.

For the On Line diagnosis of the system, sensors is provided at following locations:

1. Temperature at Inlet and Outlet of the system of both heat exchanger and at the inlet and outlet of the chiller line.
2. Load Cell based fuel consumption system measurement.

Some fuel will return by the engine as there will be some leak off and return line like Right bank leak off , Left bank leak off , Fuel transfer pump relief and Regulated power return so we have an arrangement of heat exchanger(9.1,9.2) (shell and tube type) and chiller(11.0) of 12TR capacity. We have six number of RTD sensor(8.1,8.2,8.3,8.4,8.5,8.6) to know the temperature of fuel being supplied to the system and a pair of fuel temperature control valve(10.1,10.2) at chiller line to maintain the desired temperature of the system.

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

Chapter: 5

OPERATING PROCEDURE

FOR FUEL CONSUMPTION MEASUREMENT SYSTEM

a) Step 1:

Check all the connections. Now before starting the system make sure the manual valve (1.0) which is located at the loco suction and automated valve(7.0) is open as it have limit switch we can check it by naked eye as well as PLC.

b) Step 2:

Push the start button to operate the motor pump assembly.

c) Step 3:

There is an electrically actuated valve which is available just after pump and filter, will automatically open and the filling operation will start.

d) Step 4:

There are two type of operations available in control panel i.e.

a) Local b) Remote

Please Note: "On Control Panel User has to select the Switch "Local or Remote".

Pre-Set/ Pre-Configured System Configuration Settings on HMI installed on Control Panel (CP):

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

1- **MAX Fuel Tank Mass (Max FTM)**: Max Mass of the Fuel Tank (Tank Mass+ Fuel Mass) in Kg

2- **MIN Fuel Tank Mass (Min FTM)**:: Min Mass of the Fuel Tank (Tank Mass+ Fuel Mass) in Kg

(Please Note: The "**Max FTM**: Max Mass of the Fuel Tank" is used to STOP the Fuel Tank Filling Pump Motor. Also "**Min FTM** Min Mass of the Fuel Tank" will give warning on Tower Light & HMI).

(Please Note: The "**Max FTM**: Max Mass of the Fuel Tank" is used to STOP the Fuel Tank Filling Pump Motor. Also "**Min FTM** Min Mass of the Fuel Tank" will give warning on Tower Light & HMI). Also the Hooter will generate sound.

e) <u>Step 5:</u>

When the Fuel Tank needs to be filled, the USER can use the HMI Screen available on Control Panel (CP) for Fuel Tank Filling locally as follows:

1- User Presses "**Start Fuel Tank Filling**" button on HMI. The following operations will get performed:
   1- First the PLC Controller will check the Tank Mass from IND 570 to see the actual fuel available in the Tank. If it is already at or above **MaxFTM**, it will simply give a pop up on

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

HMI screen saying Fuel Tank is full. It will also show the actual Fuel Mass in the Fuel Tank.

2- In case the Fuel Tank is not full to pre-set level (**MaxFTM**), the PLC Controller will automatically open the electrically operated Valve – Fuel Circuit Code: (7.0). Through the Limit switch mounted on Valve (7.0) PLC controller will become sure that the Valve (7.0) is now open. Through the limit switch mounted on Valve 1.0 the PLC controller will know that Suction Valve (1.0) is open. In case Suction Valve (1.0) is not open it will give Pop-up on HMI and yellow light will glow on Tower Light. It will ask user/operator to open the Suction Valve (1.0). Please note that Suction Valve (1.0) is to be kept open always. Once PLC controller is sure that Valve (1.0) and Valve (7.0) are open, it will put on the Electric Motor (3.0) and the filling process will start. PLC Controller will also look at Clogging Indicator Switch connected with Filter (6.0) while Fuel Tank is being filled. In case the Fuel Filter (6.0) is clogged, it will give a pop up on HMI screen. The mass of the Fuel Tank will keep increasing, as the fuel is being pumped into the Fuel Tank. The controller will stop the electric motor (3.0) once the Fuel Tank is filled to preset level. In case the mass of the Fuel tank does not increase when Motor (3.0) is running then PLC controller will immediately STOP the motor and will give pop up “Fuel supply from LOCO Tank not available” on HMI on Control Panel (CP).

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

3) Once the Fuel Tank reaches its **Max FTM** level, the following activities shall be performed by the PLC controller:

- PLC Controller will stop the electric motor (3.0).
- PLC Controller will Close Valve (7.0).
- PLC Controller will wait for 30 seconds after closing Valve (7.0) to ensure that fuel dripping from fill pipe stops. At this moment the Mass of the Fuel Tank will stay constant (stabilize). The Mass of the Fuel can be seen on HMI.
- Now the Fuel Tank Filling operation is complete.

Safety Interlocks implemented in Control Panel (CP):

1- Electric Motor (3.0) will start only when Valve (1.0) and Valve (7.0) are open.

Electric Motor (3.0) will never run if the Fuel Tank Mass is at or above the Pre-Set **MaxFTM**.
After reaching the maximum level, it will give signal on PLC as we have level switch for that. If in case level switch will not work we have an arrangement of secondary containment which will protect the load cell from fuel.

f) Step 6:

After completion of filling operation, the loco engine will start suction of fuel from SS tank by passing through heat exchanger. During combustion process of fuel , some fuel will return by the engine as there will be some leak off and return line like Right bank

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

leak off , Left bank leak off , Fuel transfer pump relief and Regulated power return so we have an arrangement of heat exchanger (shell and tube type) at power return line and chiller of 12TR capacity. These heat exchanger is designed in such a way that there will be 0.**01Bar** pressure drop in fuel line. As the fuel passes from heat exchanger we have RTD sensor at inlet and outlet of each of them to know the exact temperature of fuel. Two number of RTD sensor is placed at inlet and outlet of chiller line to know the chilled water temperature and to maintain the temperature of fuel to desired valve we have two fuel temperature control valve.

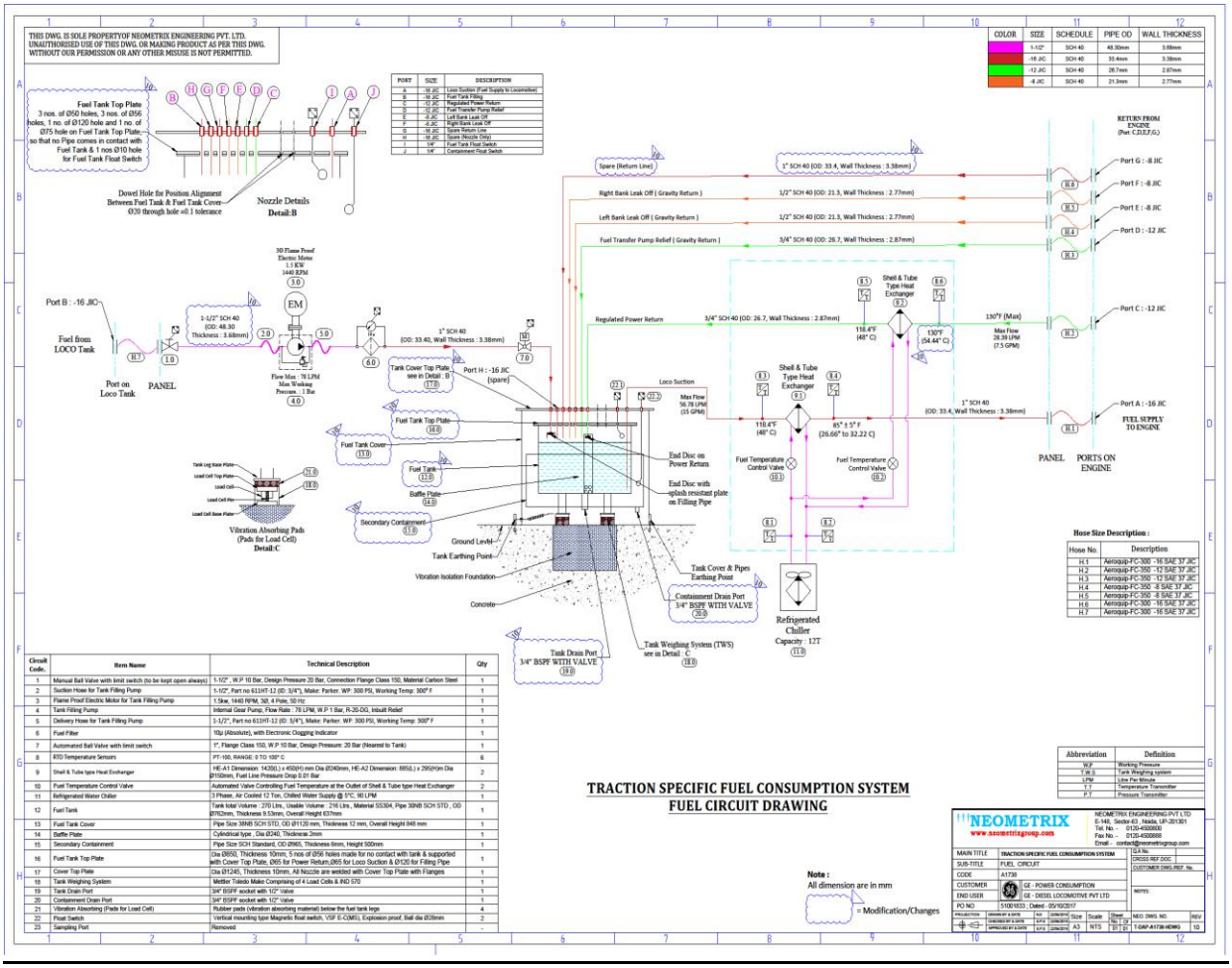
g) Step 7:

By operating the system for a certain interval of time, we can actually calculate the Net Fuel consumption by monitoring the fuel which is been consumed by the engine as it will give digital output on load cell panel.

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

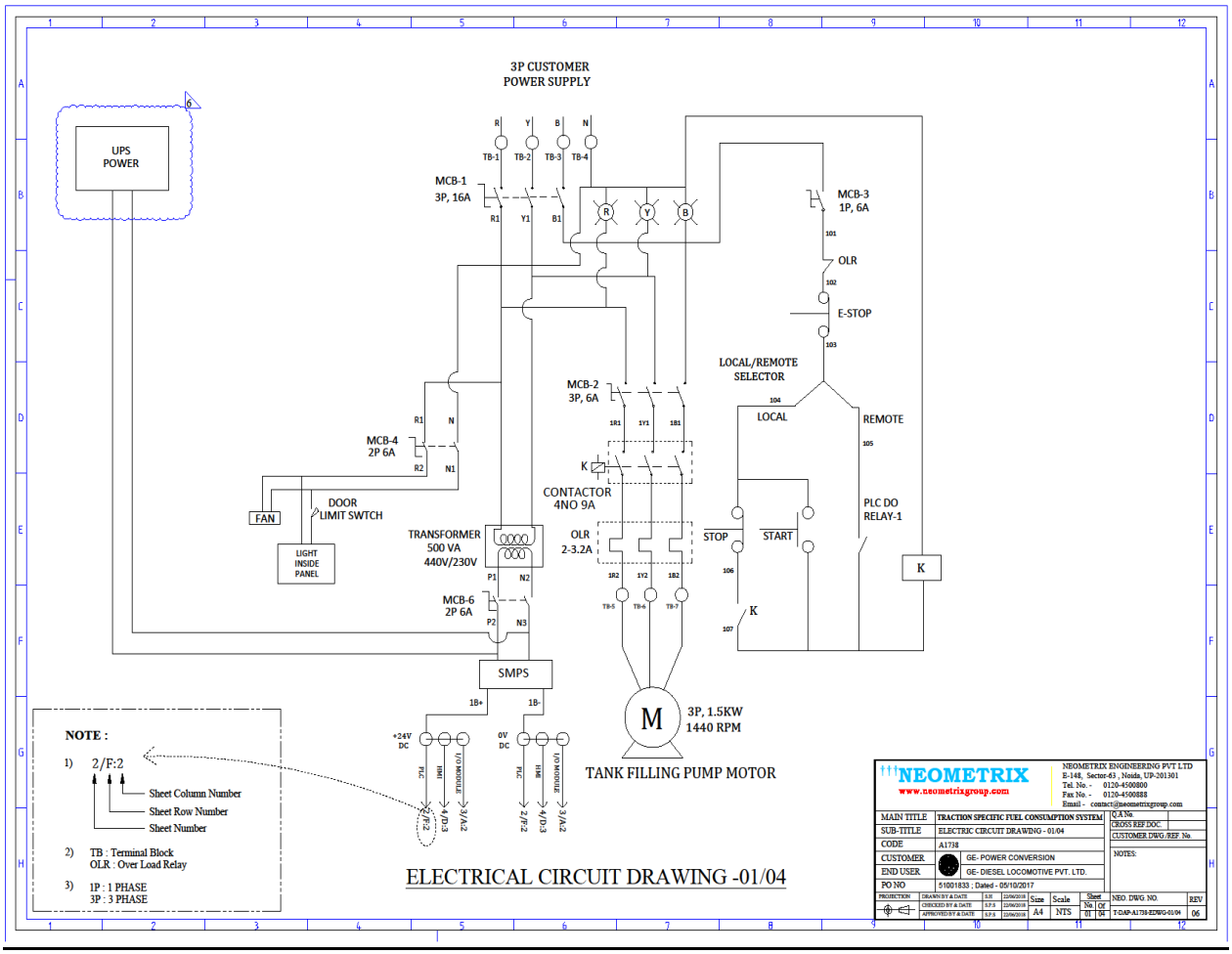
7) List of Attached Drawings:

a) Fuel circuit drawing:



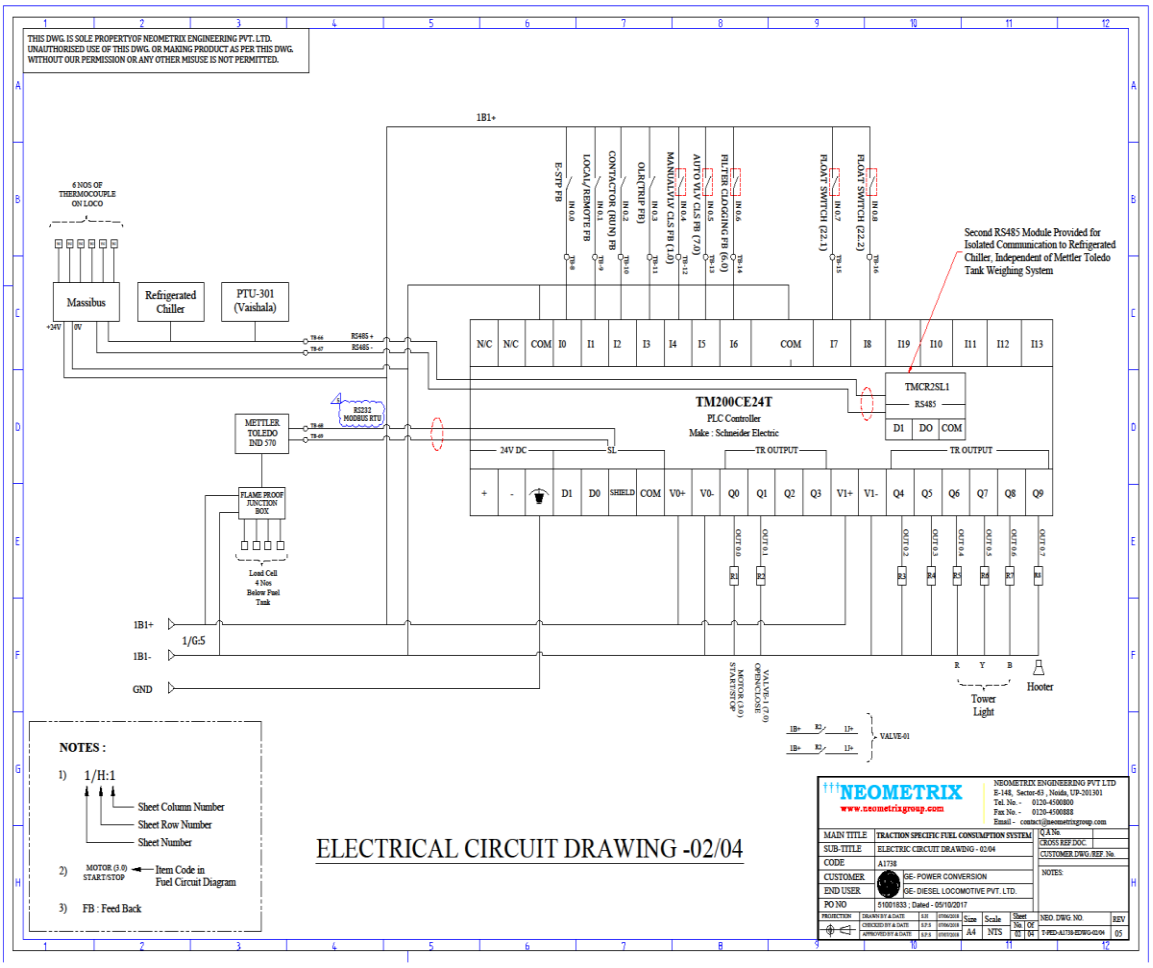
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

b) Electrical circuit Drawing -01/04:



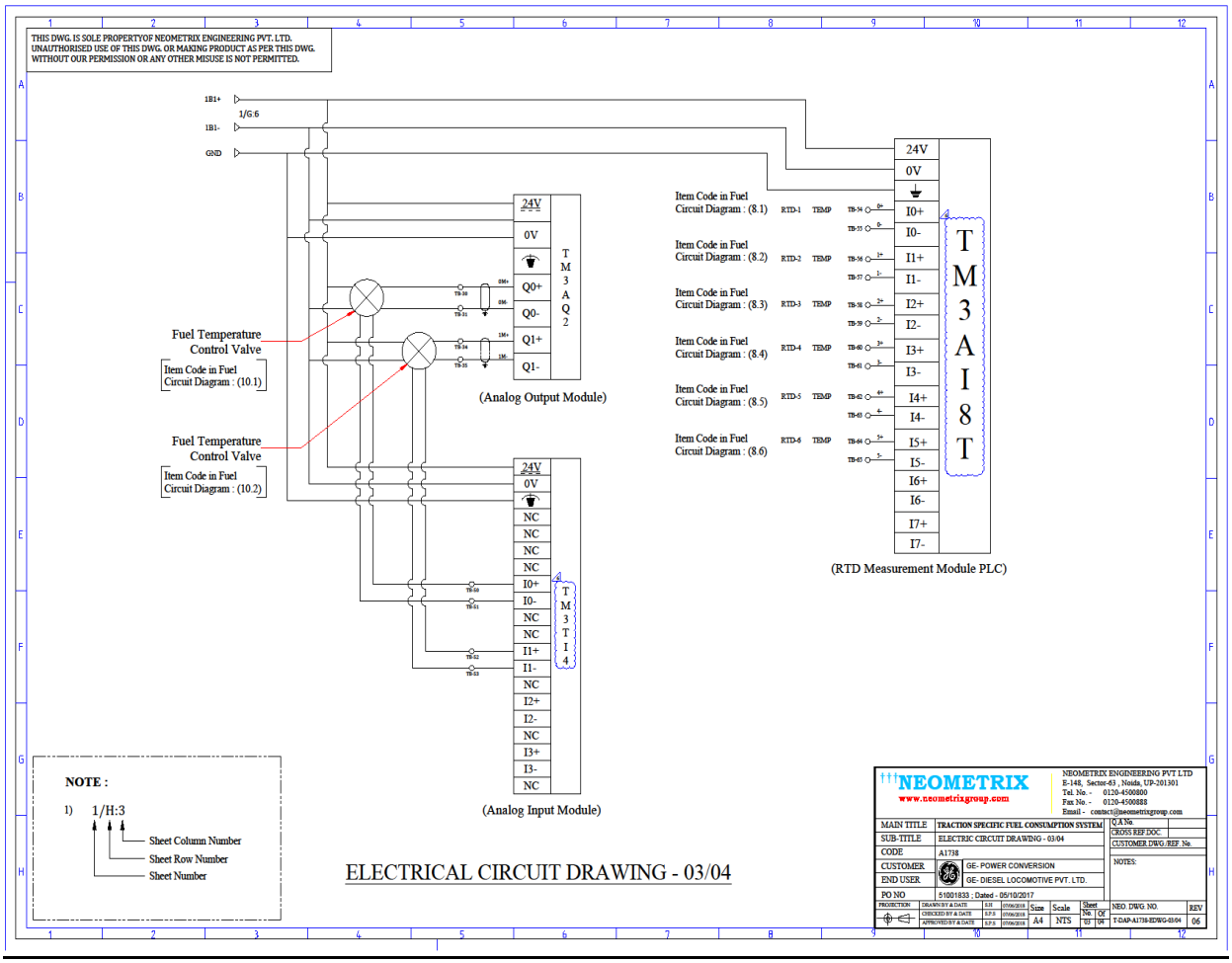
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

c) Electrical circuit drawing-02/04:



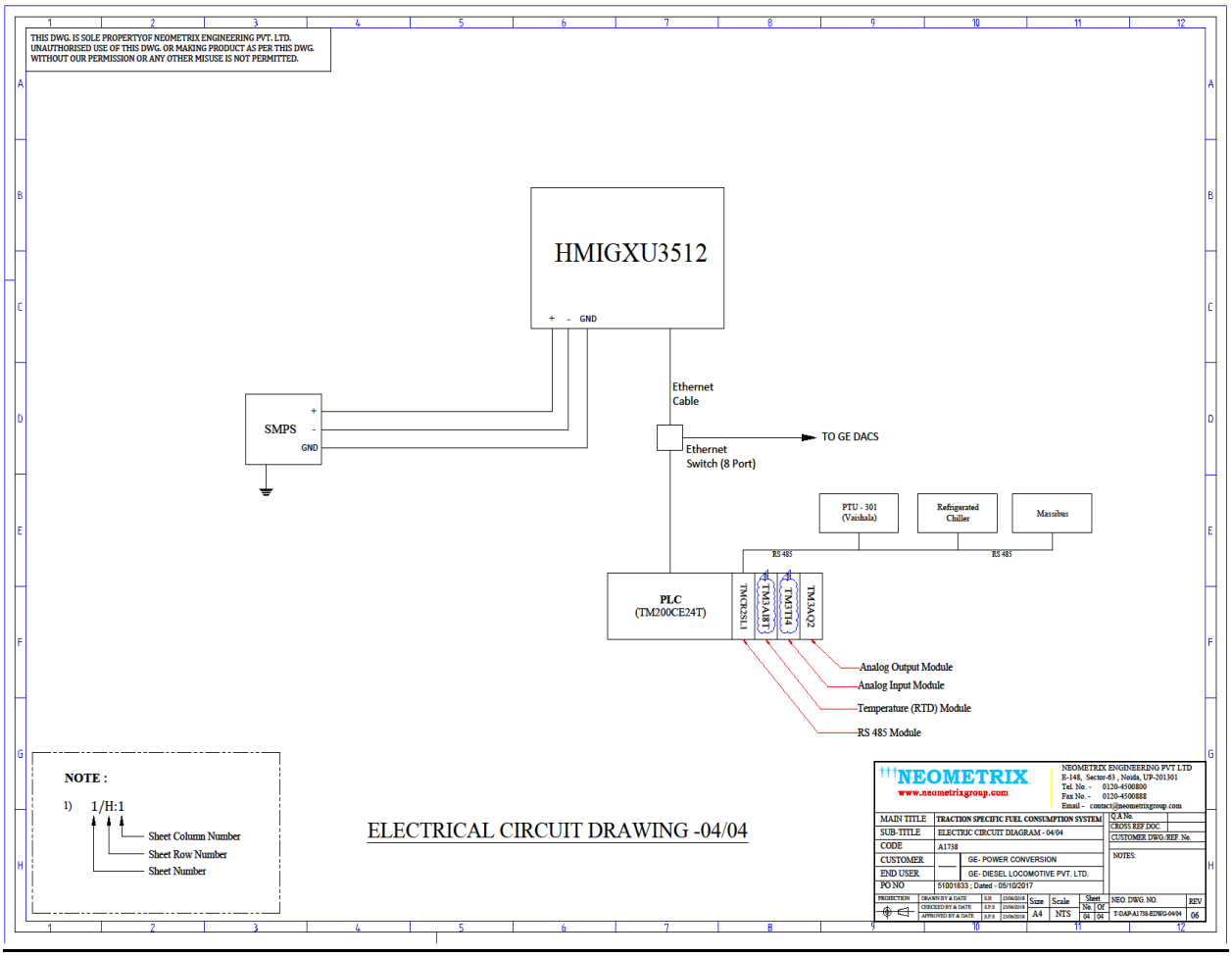
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

D) ELECTRICAL CIRCUIT DRAWING-03/04:



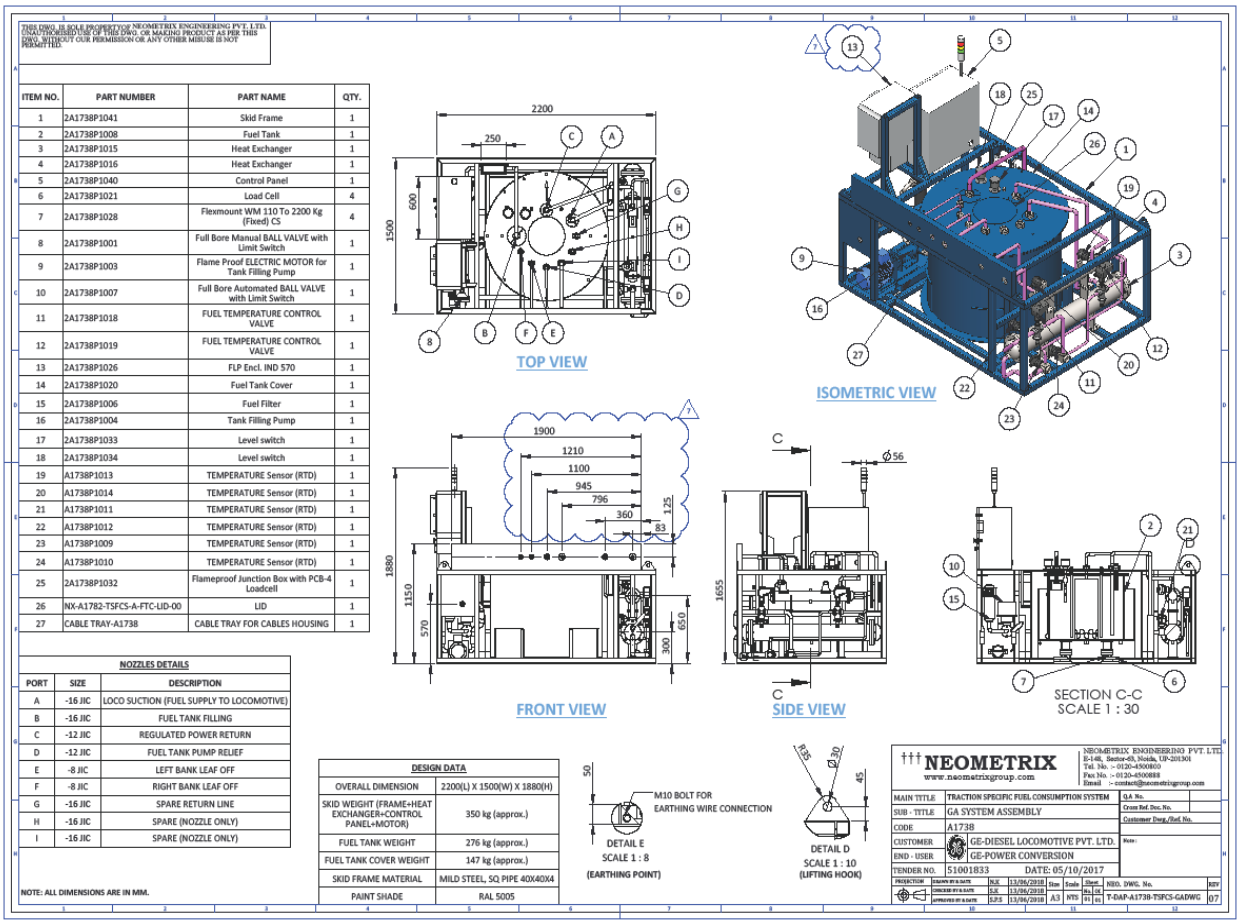
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

E) ELECTRICAL CIRCUIT DRAWING-04/04:



Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

f) GA drawing of TSFCS:



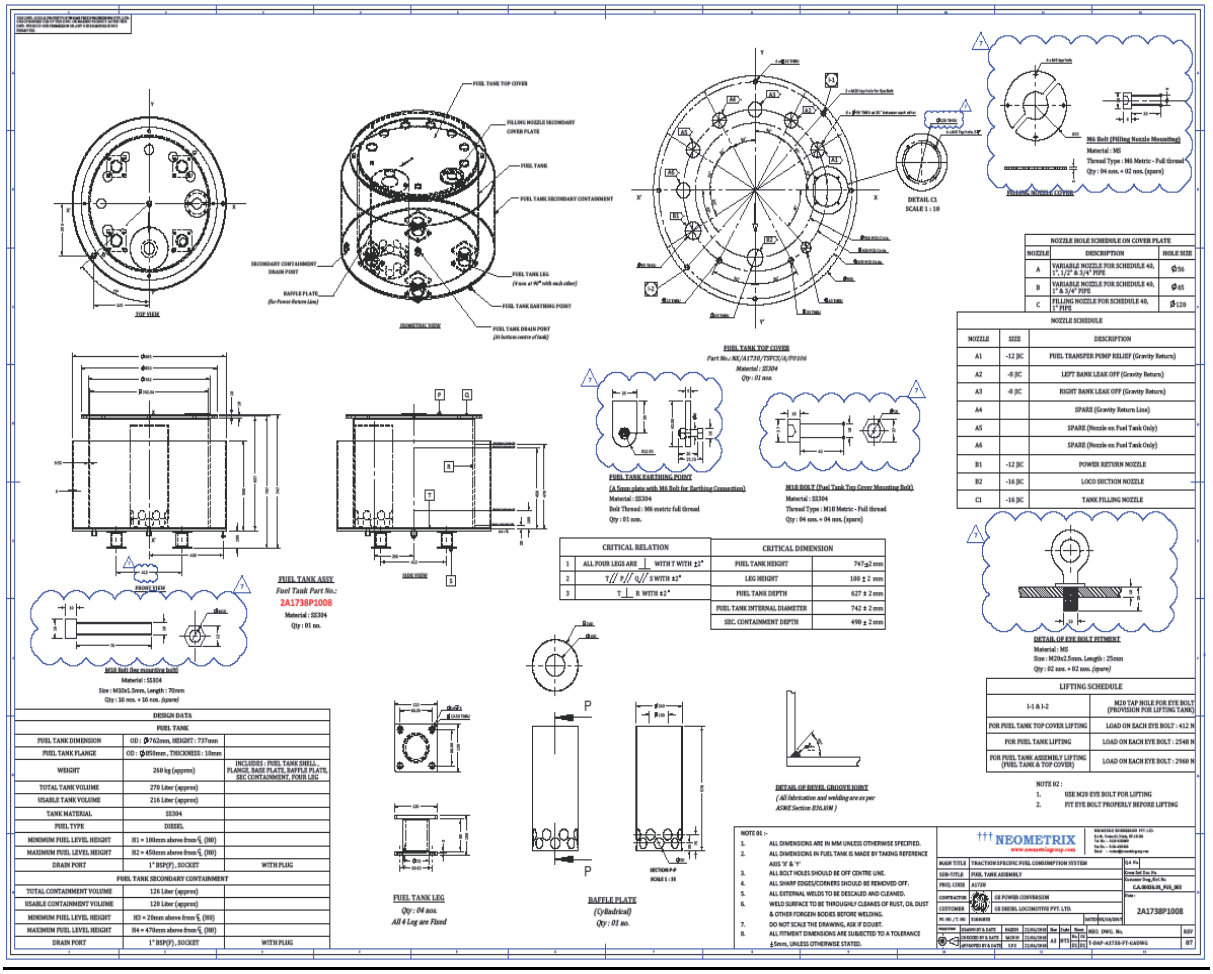
ITEM NO.	PART NUMBER	PART NAME	QTY.
1	2A1738P1041	Skid Frame	1
2	2A1738P1008	Fuel Tank	1
3	2A1738P1015	Heat Exchanger	1
4	2A1738P1016	Heat Exchanger	1
5	2A1738P1040	Control Panel	1
6	2A1738P1021	Load Cell	4
7	2A1738P1028	Flexmount WM 110 To 2200 Kg (Fixed) CS	4
8	2A1738P1001	Full Bore Manual BALL VALVE with Limit Switch	1
9	2A1738P1003	Flame Proof ELECTRIC MOTOR for Tank Filling Pump	1
10	2A1738P1007	Full Bore Automated BALL VALVE with Limit Switch	1
11	2A1738P1018	FUEL TEMPERATURE CONTROL VALVE	1
12	2A1738P1019	FUEL TEMPERATURE CONTROL VALVE	1
13	2A1738P1026	FLP Encl. IND 570	1
14	2A1738P1020	Fuel Tank Cover	1
15	2A1738P1006	Fuel Filter	1
16	2A1738P1004	Tank Filling Pump	1
17	2A1738P1033	Level switch	1
18	2A1738P1034	Level switch	1
19	A1738P1013	TEMPERATURE Sensor (RTD)	1
20	A1738P1014	TEMPERATURE Sensor (RTD)	1
21	A1738P1011	TEMPERATURE Sensor (RTD)	1
22	A1738P1012	TEMPERATURE Sensor (RTD)	1
23	A1738P1009	TEMPERATURE Sensor (RTD)	1
24	A1738P1010	TEMPERATURE Sensor (RTD)	1
25	2A1738P1032	Flameproof Junction Box with PCB-4 Loadcell	1
26	NX-A1782-TSFCS-A-FTC-LID-00	LID	1
27	CABLE TRAY-A1738	CABLE TRAY FOR CABLES HOUSING	1

NOZZLES DETAILS		
PORT	SIZE	DESCRIPTION
A	-16 JIC	LOCO SUCTION (FUEL SUPPLY TO LOCOMOTIVE)
B	-16 JIC	FUEL TANK FILLING
C	-12 JIC	REGULATED POWER RETURN
D	-12 JIC	FUEL TANK PUMP RELIEF
E	-8 JIC	LEFT BANK LEAF OFF
F	-8 JIC	RIGHT BANK LEAF OFF
G	-16 JIC	SPARE RETURN LINE
H	-16 JIC	SPARE (NOZZLE ONLY)
I	-16 JIC	SPARE (NOZZLE ONLY)

DESIGN DATA	
OVERALL DIMENSION	2200(L) X 1500(W) X 1880(H)
SKID WEIGHT (FRAME+HEAT EXCHANGER+CONTROL PANEL+MOTOR)	350 kg (approx.)
FUEL TANK WEIGHT	276 kg (approx.)
FUEL TANK COVER WEIGHT	147 kg (approx.)
SKID FRAME MATERIAL	MILD STEEL, SQ PIPE 40X40X4
PAINT SHADE	RAL 5005

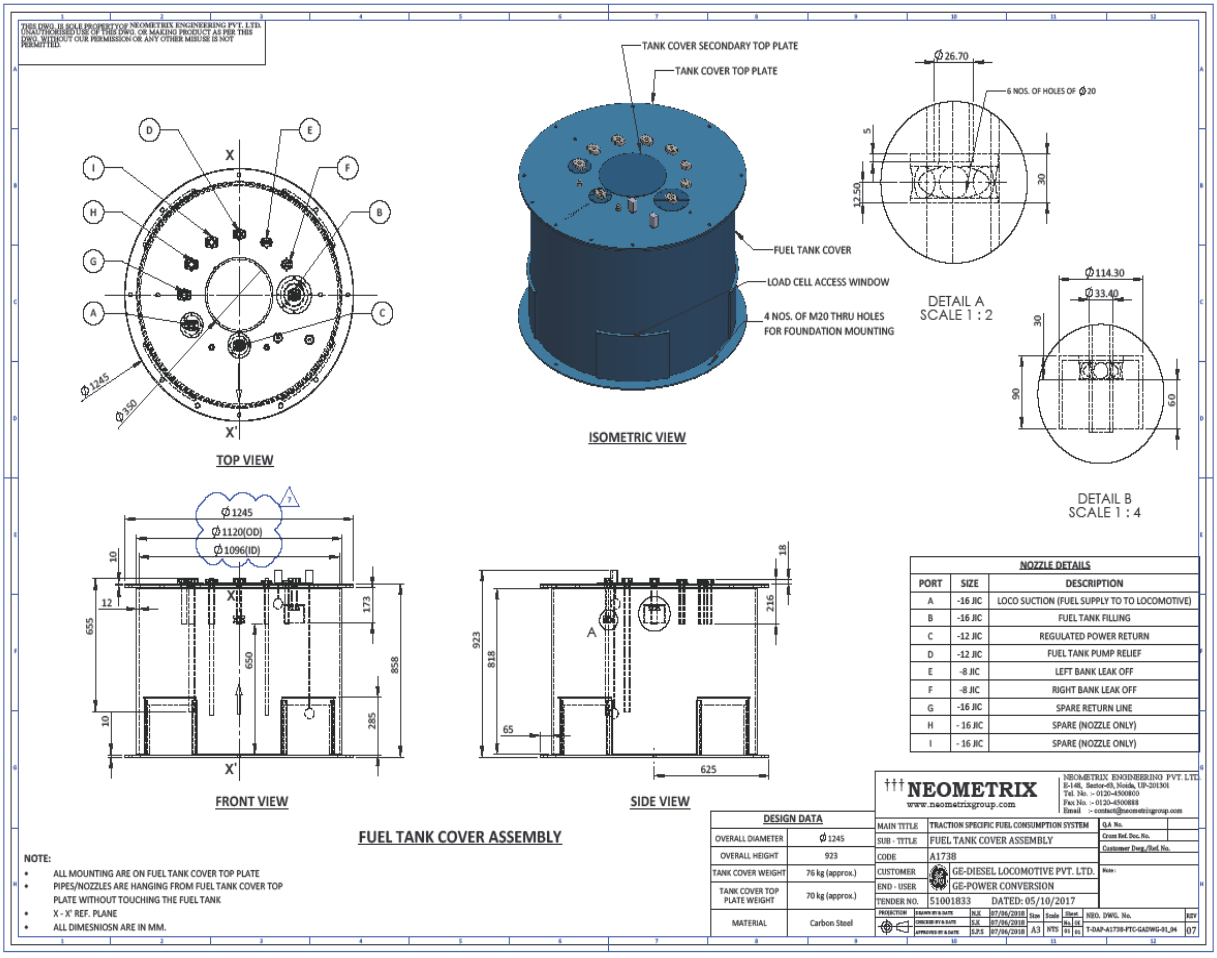
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

g) Fuel Tank Drawing:



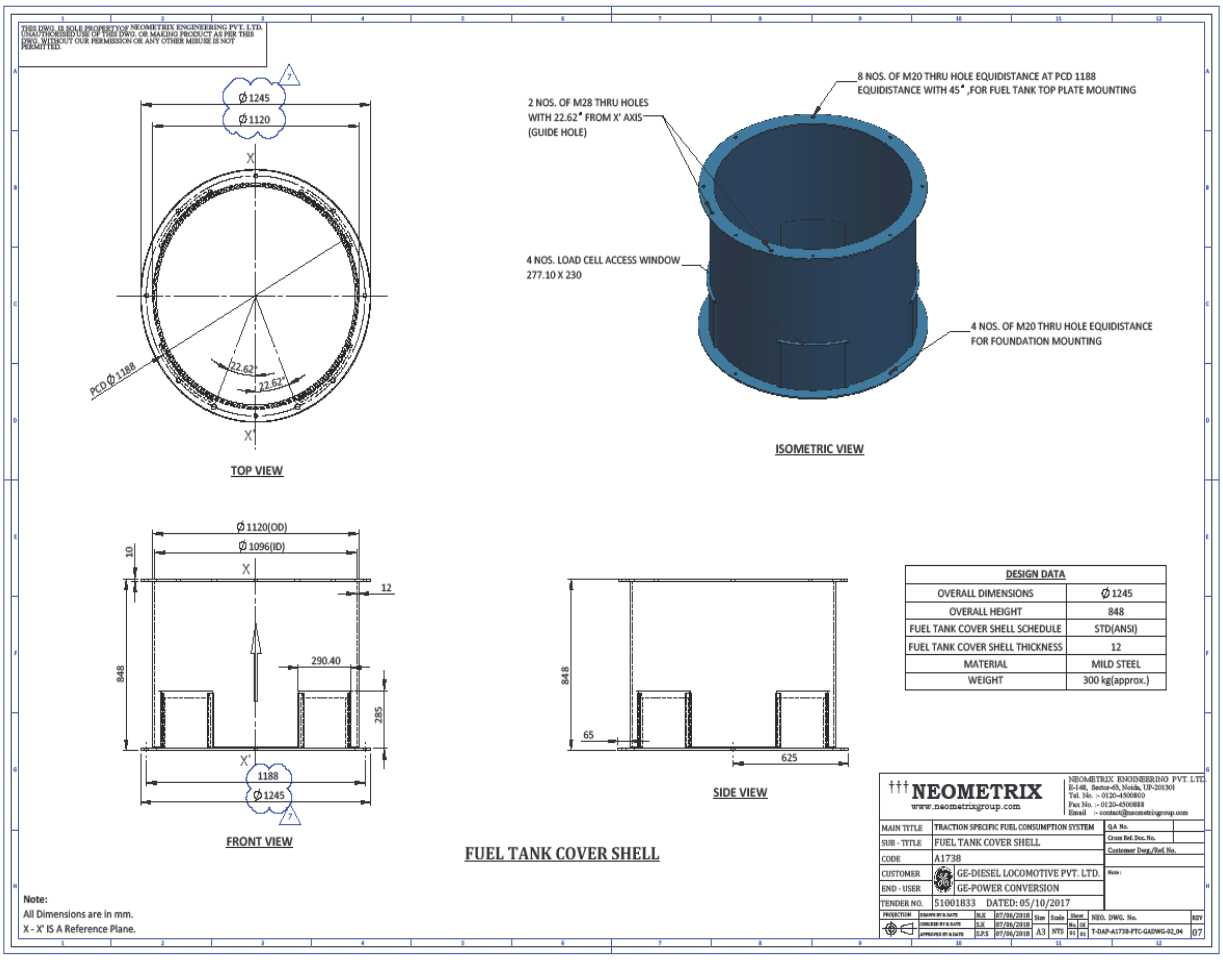
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

h) Fuel tank cover drawing-01/04:



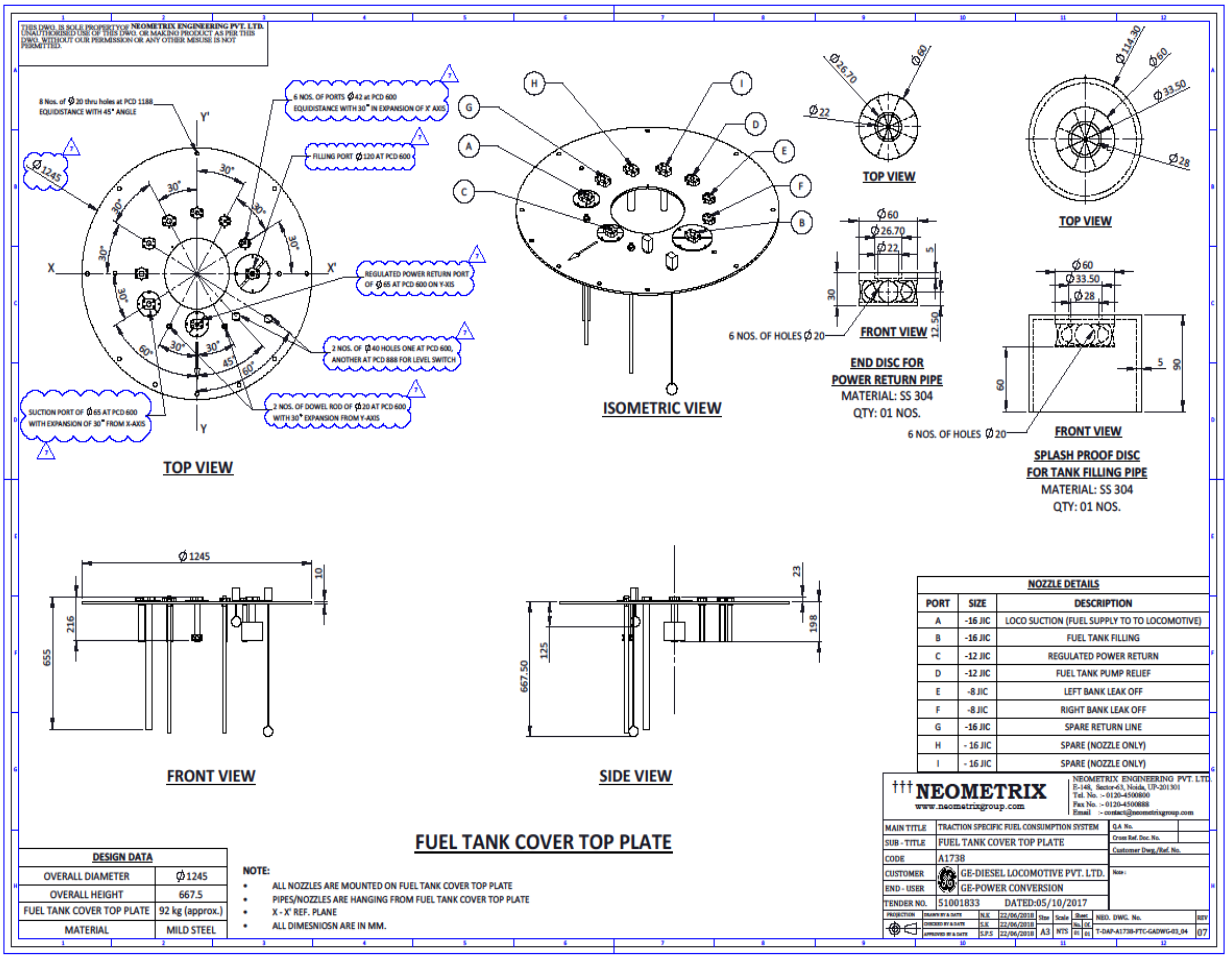
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

i) Fuel tank cover drawing-02/04:



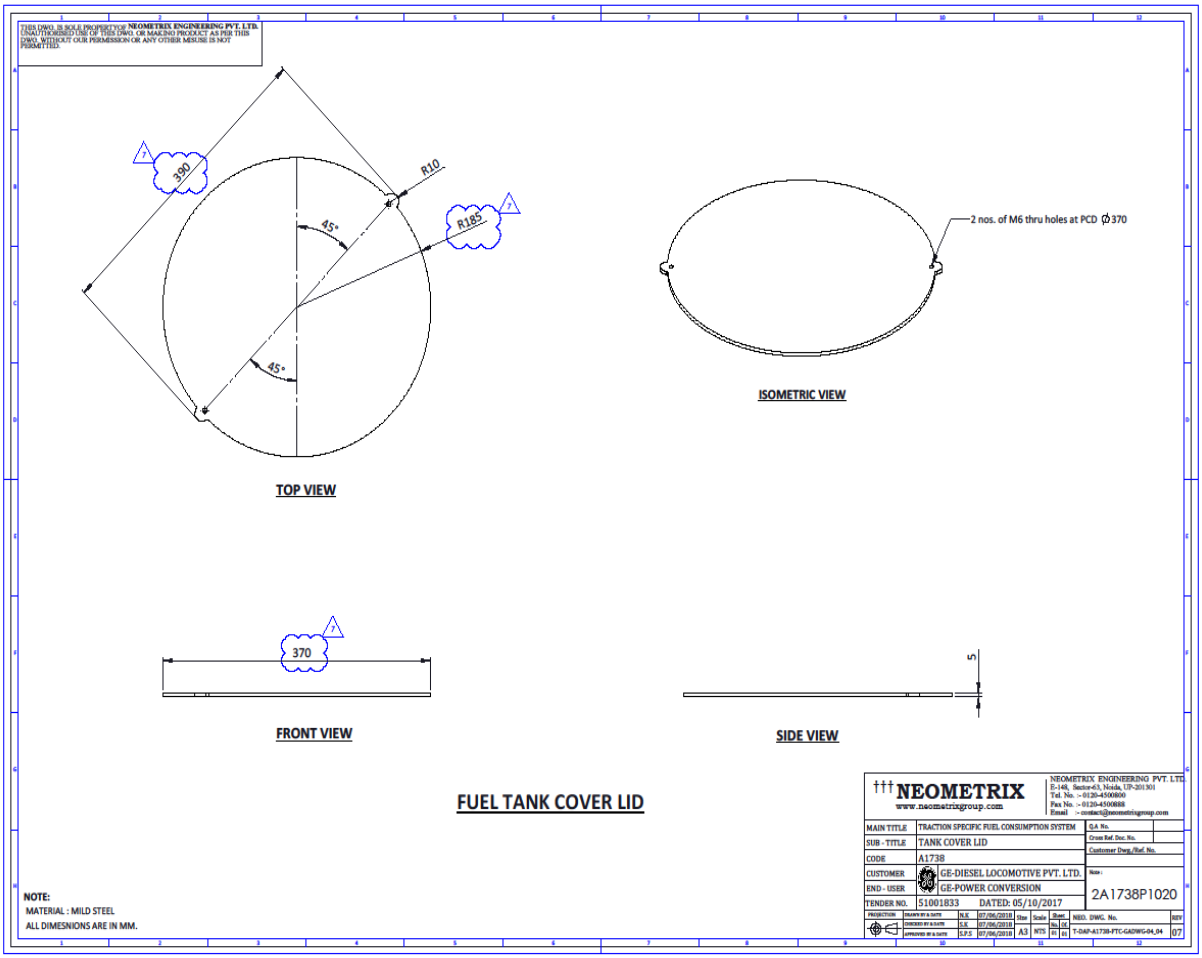
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

k) Fuel tank cover drawing-03/04:



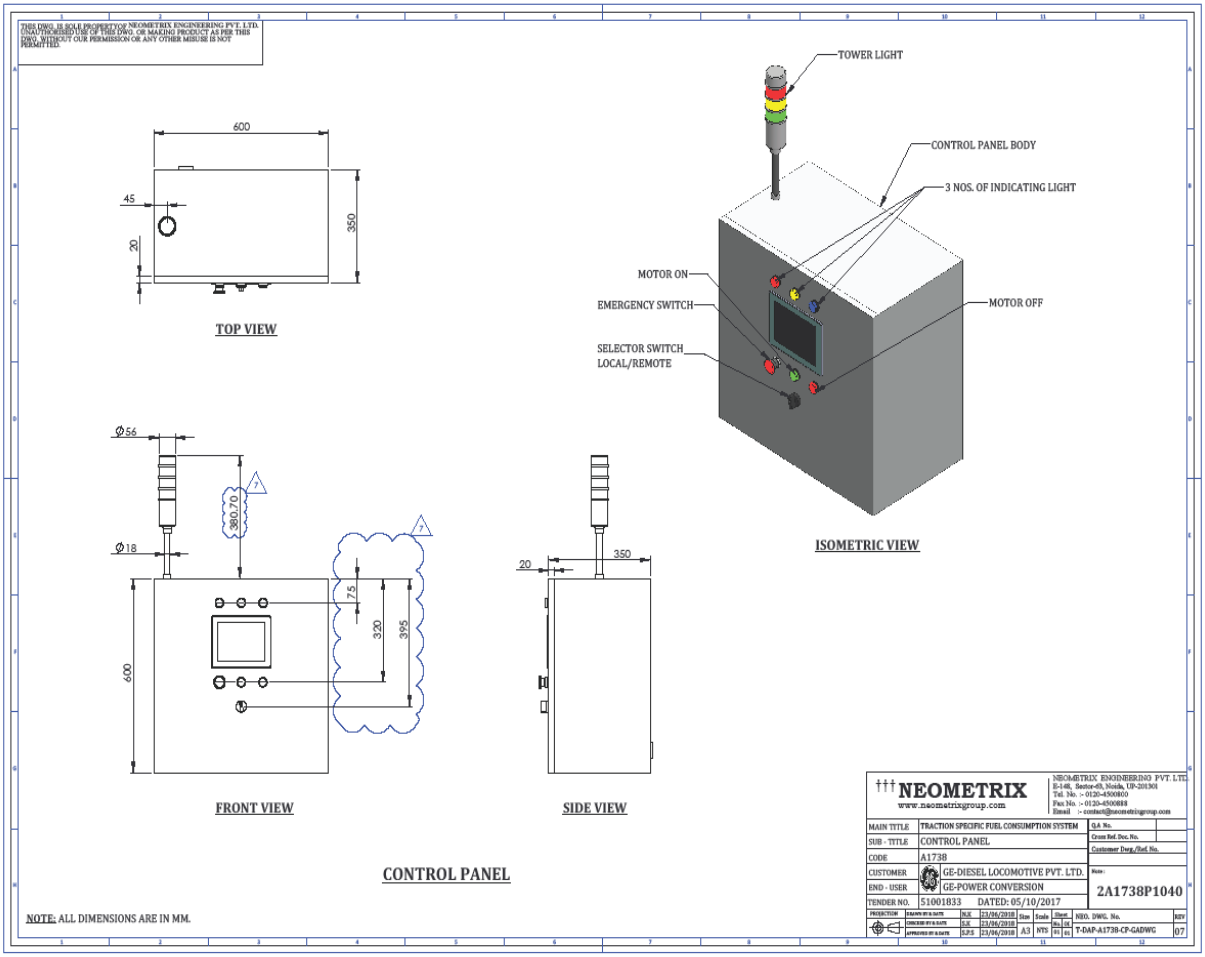
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

l) Fuel tank cover Drawing-04/04:



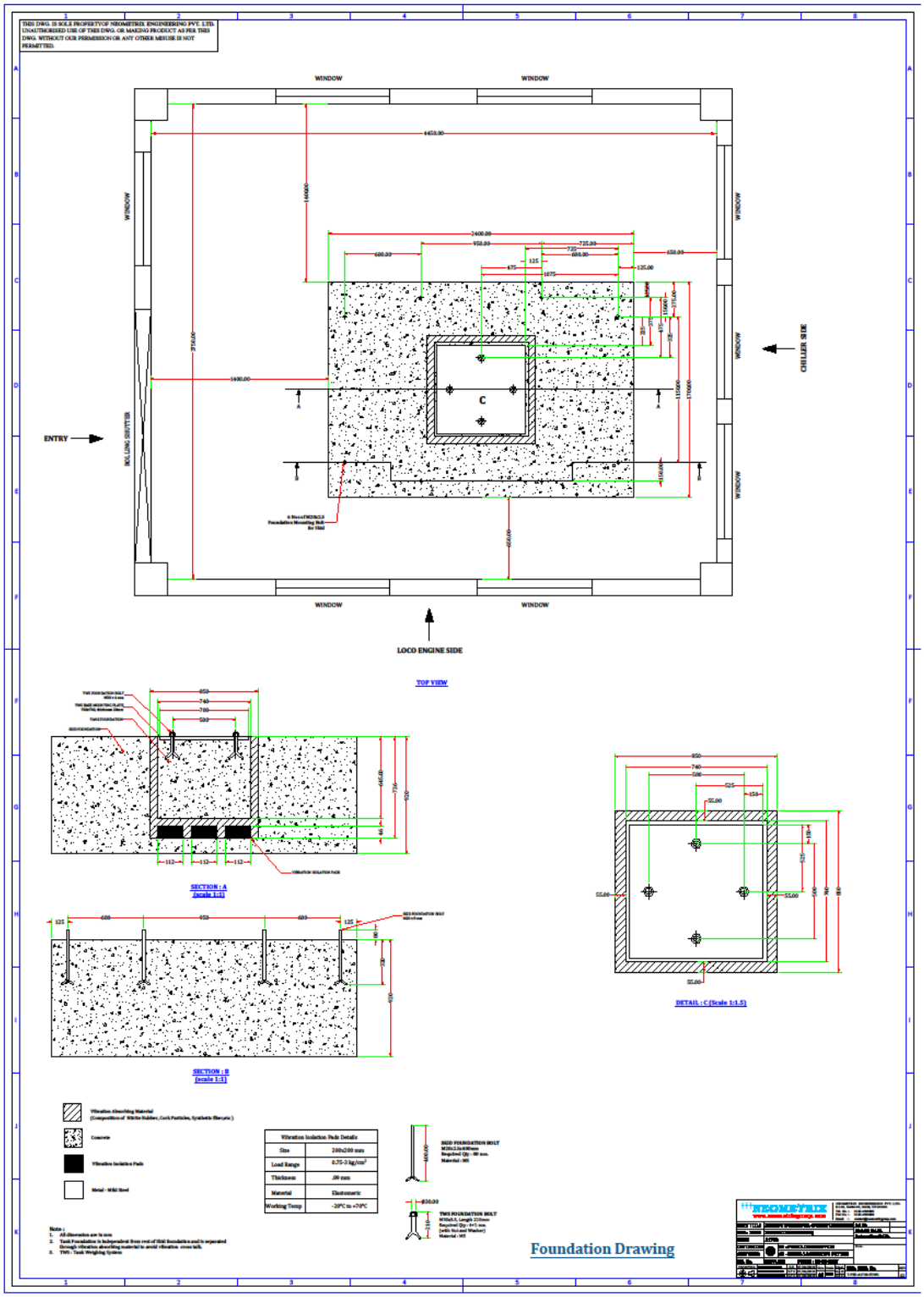
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

m) Control Panel GA Drawing:



Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

n) Foundation Drawing for TSFCS:



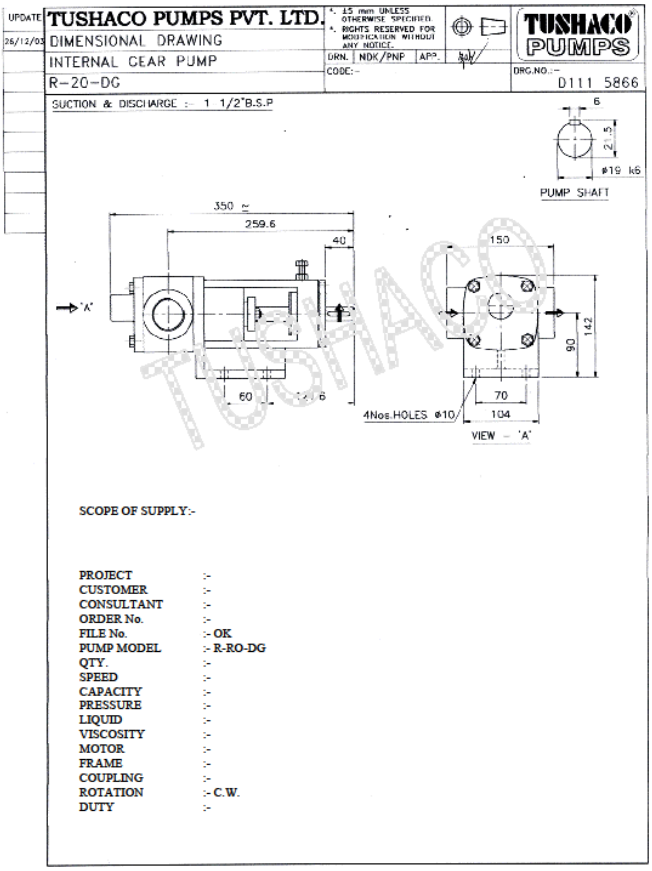
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

Chapter 9- Catalog

- Flameproof Electric motor

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

➢ Pump



Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

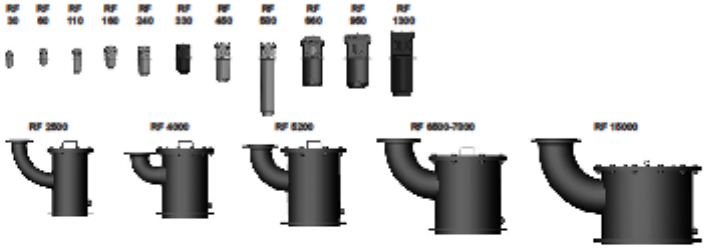
Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

- Fuel Filter

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

HYDAC INTERNATIONAL

Return Line Filter RF
up to 15000 l/min, up to 25 bar



1. TECHNICAL SPECIFICATIONS

1.1 FILTER HOUSING

Construction

The filter housings are designed in accordance with international regulations. They consist of a filter housing and a threaded cover plate.

Standard equipment:

- bypass valve in the element. For RF 450/580 the bypass valve is built into the cover plate as standard.
- connection for a clogging indicator

1.2 FILTER ELEMENTS

HYDAC filter elements are validated and their quality is constantly monitored according to the following standards:

- ISO 2941, ISO 2942, ISO 2943 ISO 3724, ISO 3968, ISO 11170 ISO 16889

Number of filter elements

RF	Elements
30	1x0030R
60	1x0060R
110	1x0110R
160	1x0160R
240	1x0240R
330	1x0330R
450	1x0450R
580	1x0580R
660	1x0660R
950	1x0950R
1300	1x1300R
2500	3x0850R
4000	5x0850R
5200	4x1300R
6500	5x1300R
7800	6x1300R
15000	10x1300R

Filter elements are available with the following pressure stability values:

Optimicron® (ON):	20 bar
Paper (P/HC):	10 bar
Stainl. st. wire mesh (W/HC):	20 bar
Stainless steel fibre (V):	210 bar
Betamicron®/Aquamicron® (BN4AM):	10 bar
Aquamicron® (AM):	10 bar

1.3 FILTER SPECIFICATIONS

Nominal pressure	RF 30, 2500 to 15000: RF 450 and 580: RF 60 to 1300:	10 bar 16 bar 25 bar
Temperature range	-10 °C to +100 °C	
Material of filter housing and cover plate	RF 30: RF 60 to 580: RF 660 to 1300: RF 2500 to 15000:	PA 66 Aluminium EN-GJS-400-15 Welded steel
Type of clogging indicator	VR Connection thread G ½ (return line indicator up to 25 bar operating pressure) VM Differential pressure indicator only for RF 450 and 580	
Pressure setting of clogging indicator	2 bar (others on request)	
Bypass cracking pressure	3 bar (others on request)	

1.4 SEALS

NBR (=Perbunan)

1.5 INSTALLATION

Tank-top or inline filter.
RF 450 and 580 are also suitable for horizontal installation (with check valve).

1.6 SPECIAL MODELS AND ACCESSORIES

On request

1.7 SPARE PARTS

See Original Spare Parts List

1.8 CERTIFICATES AND APPROVALS

On request

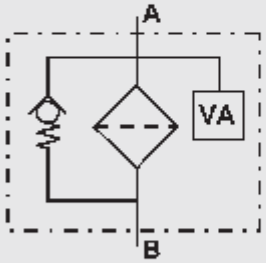
1.9 COMPATIBILITY WITH HYDRAULIC FLUIDS ISO 2943

- Hydraulic oils H to HLPD DIN 51524
- Lubrication oils DIN 51517, API, ACEA, DIN 51515, ISO 6743
- Compressor oils DIN 51506
- Biodegradable operating fluids VDMA 24568 HETG, HEES, HEPG
- Fire-resistant fluids HFA, HFB, HFC and HFD
- Operating fluids with high water content (>50% water content) on request

1.10 IMPORTANT INFORMATION

- Filter housings must be earthed.
- When using electrical clogging indicators, the electrical power supply to the system must be switched off before removing the clogging indicator connector.
- Filters must be flexibly mounted and not fixed rigidly to the floor or used as a pipe support.

Symbol for hydraulic systems



VA = clogging indicator

E 7.116.7/11.16

HYDAC | 1

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

- Level switch

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

NEOMETRIX

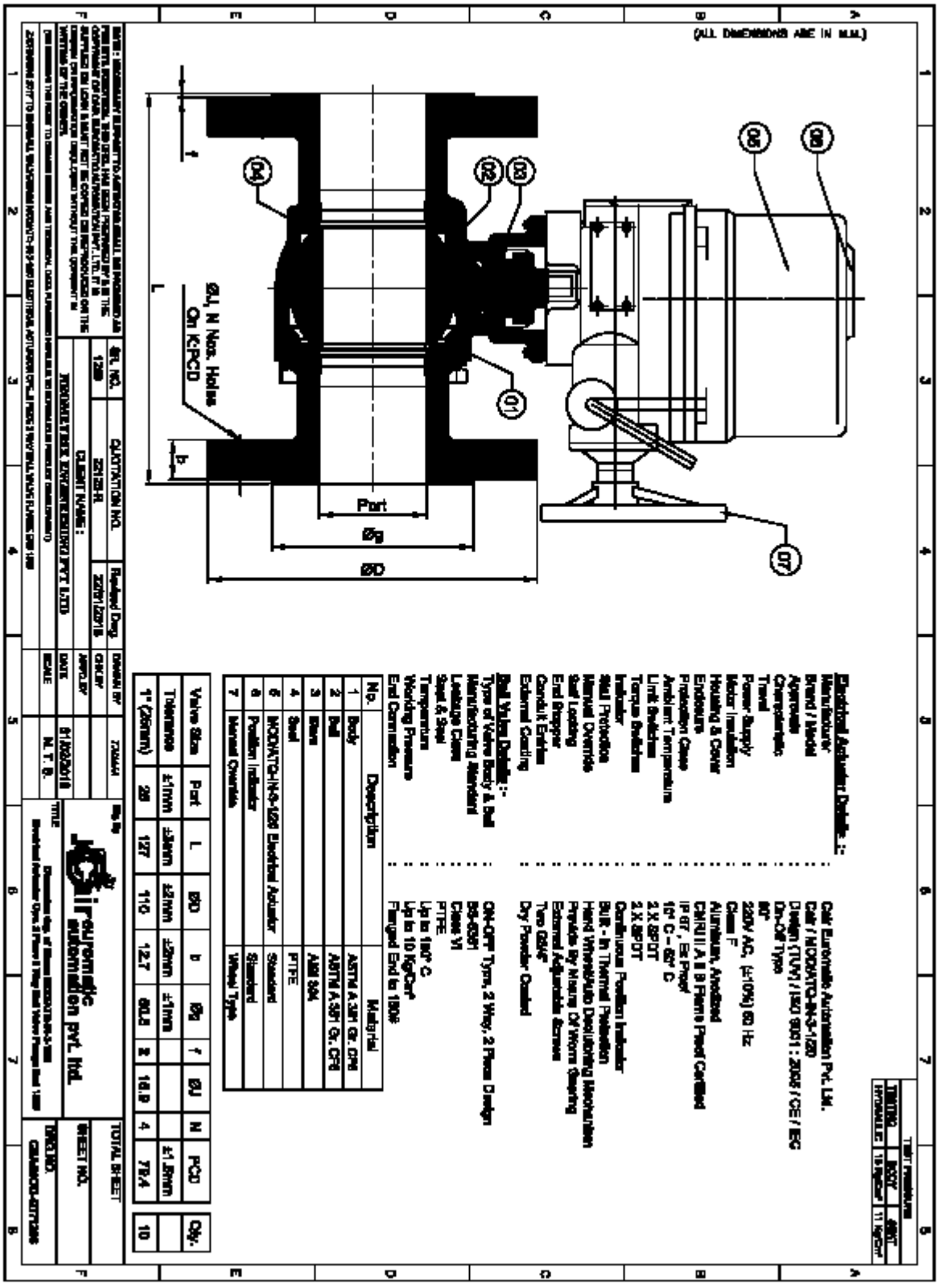
SHRIDHAN®
Automate your Field

FLOAT & DISPLACER TYPE LEVEL SWITCHES

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

Automated ball valve with limit switch

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

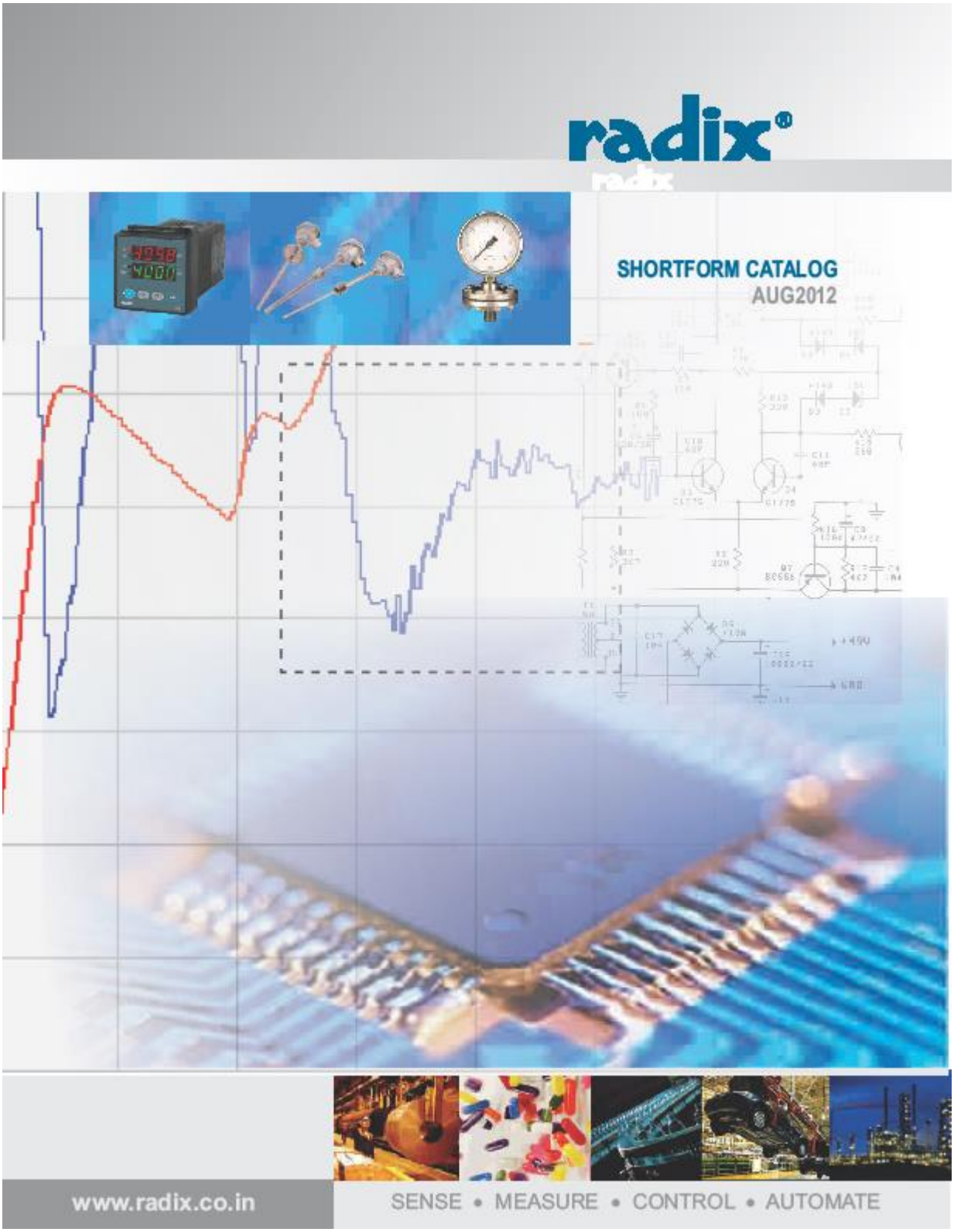


Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com

RTD

Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com



Neometrix Engineering (P) Limited. E-148, Sec-63 Noida-201301.
Tel: 91-120-4500800, (100 Lines), Fax: +91-120-4500888, Email - contact@neometrixgroup.com
Website - www.neometrixgroup.com