ICON 2

1. FEATURES AND CHARACTEIRICS

- High end Micro-controller(DSP) technology
- Wide range of auxiliary supply: 7V to 45Vdc.
- Low power Consumption : 200 mA @ 12 V DC.
- Alphanumeric 16X4 or 16X2 LCD display with keypad for ease of operation.
- Input Keys: Multi Function 7 Keys for mode selection and interaction withleds on them.
- Display and supervision of Mains & D.G voltages for UV, OV, Phase missing.
- Excellent load monitoring- no-load, overload and unbalanced load warning, & trip.
- GSM modem for communication through SMS to 2 nos of Mobiles. To send info about last 24 hour performance (parameters can be selected) . Alert on , warning & trip, SMS .
- Measurements of different Mains and Generator parameters.
- Ten internal fault annunciation for start failure, over speed, low battery, stop failure etc.
- Four spare terminals for connecting to external fault signals.
- Display and supervision of battery voltage.
- Isolated inputs and outputs (through relay board).
- Parameter settings from front panel keypad (password protected).
- Periodic test feature.
- Six modes: Auto, Manual, Test, Bypass mode, Mains Display and Programming mode.
- Over speed indication/shutdown.
- DG starting process supervision.
- Indication of CB status.

- Wide array of time settings for start delay, stop delay, mains restoration, re-cooling etc.
- Energize to On (run) and energize to Off (stop) option , programmable.
- Real Time Clock (RTC) provided. Periodic SMS, Maintenance overdue dates programmable.
- Size: 165W X 125 H X 50 D in mm

Optional Features

- Sensing of telecom voltage (48 V) & or cabin temperature to start the generator.
- Aviation timer for switching ON/Off cabin lights.
- Serial communication Modbus RS232.

2. OPERATING MODES

ICON operates in of the six modes described below.

Operating modes can be selected from the front keypad. Proper messages are displayed on LCD & led in each of the modes.

These six modes are:-

1. **Auto** ---- to be selected from front key pad
2. **Manual** ---- to be selected from front key pad
3. **Test** ----- to be selected from front key pad
4. **Bypass** ----- (Not from the Front keypad)
5. **Mains Display** ----- (Not from the Front keypad)
6. **Programming** ---- to be selected from front key pad

2.1 Auto Mode

In the auto mode of operation, GENSET is started automatically, if the mains either fail or exceed operating limits , the mains CB is opened and generator CB is closed.

2.1.1 Auto Stand by Mode : In Normal condition the controller remains in this mode. Voltages of the three phases are monitored continuously for operating limits . Operating limits are specified by UV / OV , phase connection error or phase missing. If any of these operating limits are exceeded then ICON takes following action:

2.1.2 Auto start Mode : The Genset Start process is initiated.

Start Delay : During engine start delay it waits to see if mains has returned to normal operating limits . This avoids false tripping .

Preheater : Optional . Starts supply to the preheater coil.

Fuel Solenoid On : After a delay the fuel Solenoid relay is energised with 2 options.

- Energise to ON is the normal operation . The fuel solenoid relay is made ON which in turn makes the Fuel Solenoid ON & supply of Fuel to Genset.
- Energise to OFF--- The Fuel Solenoid is always On & supplies Fuel to Genset.

Cranking : After engine start delay is over , crank relay operates. Min Cranking time is 2 sec & max time is 4 sec. If Oil Pressure & Speed develops above specified threshold limits , bet 2 and 4 secs the crank relay is made OFF. The threshold limits for Oil P is warning limit set through programming & the threshold limit for speed is 1000 rpm

If the Oil P & Speed are not developed above specified limits another crank is attempted after a delay of 6 seconds. The process continues till the threshold limits are reached. If the Oil P & speed is still not reached after certain no of Crank attempts (as programmed) “Start Fail” is declared.

If the cranking is successful the Genset checking process starts.

Genset Checking : A delay is provided to check the following parameters .

Engine Speed : within Underspeed & Overspeed trip limits

Genset Voltage : within UV/OV trip Limits.

If above parameters are within limits then Genset is declared as **STABLE.** DG ON led is made ON.

Mains Contactor OFF : After the Engine is found stable , the mains contactor is made OFF. Mains Contactor led gets OFF.

Genset Contactor ON : After programmable delay Genset Contactor is made ON.

LCD display starts displaying Genset parameters.

The Genset remains in this mode till ----- Mains is restored or any fault occurs.

2.1.3 Auto Normal Shut Down Mode:

When the Mains is restored, the Generator CB is opened and Mains CB is closed after the Mains restoration time. Then after a pre-programmed re-cooling time, the GENSET is shut down.

The Mains restoration time ensures that the Mains supply voltage is stable before it is made available to consumer load.

Genset CB closure is confirmed by checking that there is NO LOAD on Genset. If Genset CB non closure is sensed or Genset does not stop properly it goes to **Fault Acknowledge Mode.**

Otherwise at the End of this process the Controller goes back to **2.1.1 Auto Stand by Mode.**

2.1.4 Auto Fault Shut Down Mode:

When the fault occurs the Generator CB is opened and Mains CB. The Controller goes to FAULT Acknowledge Mode with proper message on LCD Display as well as leds.

After acknowledging the fault (correcting the fault) it goes to Manual Mode & proper mode is to be selected at this time.

2.2 Manual Mode

2.2.1 Manual Stand by Mode

In this mode ICON ignores mains voltage. It only responds to Start and Stop commands from the keypad

Precaution: Before giving Start command to generator, one must ensure that the generator CB is open

2.2.2 Manual start Mode

Start key operation initiates the start operation.

The sequential process mentioned in the Auto Start is executed. This whole process can be made manual , if specified accordingly. If Manual Process is selected , after each STEP , Start key is required to be pressed as displayed on the LCD.

When Genset is ON, The generator CB may now be switched on from keypad provided that the Mains CB is off .

LCD display starts displaying Genset parameters.

The Genset remains in this mode till ----- STOP KEY pressed or any fault occurs

2.2.3 Manual Normal Shut Down Mode:

Stop key initiates this mode. The Controller follows all the steps automatically or manually (if specified) as mentioned in the **2.1.3 Auto Normal Shut Down Mode.**

Genset CB closure is confirmed by checking that there is NO LOAD on Genset. If Genset CB non closure is sensed or Genset does not stop properly it goes to **Fault Acknowledge Mode.**

If this process is executed successfully Controller goes to **2.2.1 Manual Stand by Mode.**

2.2.4 Manual Fault Shut Down Mode:

When the fault occurs the Generator CB is opened and Mains CB. The Controller goes to **FAULT Acknowledge Mode** with proper message on LCD Display as well as leds.

After acknowledging the fault (correcting the fault) it goes to Manual Mode & proper mode is to be selected at this time.

2.3 Test Mode

Test Mode is selected by pressing the TEST key on the front pad, entering the passwaord. Test Mode can be selected only in **2.1.1 Auto Stand by Mode & 2.2.1 Manual Stand by Mode.** In this mode no-load and load test run of the GENSET is possible

If Test Mode is selected , it passes through all the STEPS mentioned in **2.1.2 Auto start Mode.**

If the start process is executed successfully , Genset Parameters are displayed for at least 2 times before Shut down process starts (the timing for test mode run can be specified).

The Shut down process starts as mentioned in **2.1.3 Auto Normal Shut Down Mode:**

If Fault is generated during the operation shut down process starts as mentioned in **2.1.4 Auto Fault Shut Down Mode:**

If Mains failure is occurred during the test mode operation, the Mains emergency operation is initiated automatically.

At the end of successful completion of Test Mode the controller goes back to Previously selected mode.

2.4 By Pass mode

Bypass mode is selected by selecting proper digital input**.**

In the Bypass mode all the **Genset Parameters** are displayed and it keeps on displaying them unless and until the Bypass digital input is restored to normal position.

In Bypass mode the Controller has no control over the Generator operations. The Genset has to be Started / Stopped externally .

This mode cannot be selected from the front keypad

2.5 Mains Display Mode.

Mains Display Mode is selected from respective digital input .

In this mode all the parameters of the Mains are displayed and it keeps on displaying them unless and until the respective digital Input is restored to normal position.

This mode cannot be selected from the front keypad

2.6 Programming Mode

This mode basically helps in programming various parameters of the ICON3.There are various sub modes in this mode and they are: (All the following passwords are editable)

1. Password 1111
    a. Set RTC

        In this RTC mode we change RTC Date (dd/mm/yy) and Time (hh:mm:ss)
2. Password 2222

    In this mode we can view and edit all the factory settings. The parameters in this mode are as follows:

    Maintenance Due date (dd/mm/yy)

    Dispatch Date (dd/mm/yy)

3. Password 3333

    In this mode there are two options View and Change.

    In View mode we can view all the parameters which have been programmed but we cannot edit them.

    In the Change mode we can edit all the parameters and then save as per the user requires. The parameters in this mode are as follows:

    Baud Rate

Battery Voltage

Digital I/p and O/p Polarity

Phase

Mains OV trip & warning value

Mains UV trip & warning value

Genset OV trip & warning value

Genset UV trip & warning value

Over Speed (RPM) trip & warning value

Under Speed (RPM) trip & warning value

Genset Overload to trip & warning value

Genset No Load trip & warning value

Oil Pressure (trip & warning value)

Oil Temperature (trip & warning value)

Coolant Temperature (trip & warning value)

Canopy Temperature (trip & warning value)

Fuel Low Level threshold

Crank Counter

Digital I/P Signal (enable/disable)

(canopy temp, low oil pressure, V belt, low radiator water level, overspeed, under speed, remote start, remote stop and digital i/p 11,12,13,14,15,16)

Start/Stop delay Timer

Preheat Timer

Safety on Timer

Warm up/Cool down Timer

Crank On/Off Timer

Contact delay Timer

Engine off Timer

Alternator trip & warning value

Analog I/P Signal (enable/disable)

(Oil pressure, oil temp, cool temp, canopy temp, alt temp and Genset rpm)

Action type --- Energise to On/ Energise to OFF.

CT Ratio

Mobile number1 and number 2

Alarm time

Total runtime

Genset Rating

BTS Low limit

AC temp (on/off)

4. Password 4444

   In this mode we can basically calibrate the following parameters

   a. Temperature

      In this mode we can calibrate the following parameters on 10 different points starting from -7 to 225 degrees centigrade.

      Oil Temp

      Coolant Temp

      Canopy Temp

      Alt Temp

   b. Oil Pressure

      In this mode we can calibrate the following parameters on 0 to 5 V.

      Oil Pressure LP (min & max)

   c. Fuel Level

      In this mode we can calibrate the following parameters by resistance.

      Min and Max Fuel Level

   d. Electrical

      In this mode we can calibrate the following parameters as Mains or Genset

3. DIGITAL INPUTS

a) Digital inputs can be **fault input** or **operation input**.

b) All Digital I/P can be configured in hardware as voltage or . . Resistive inputs

c) All Digital I/P can be configured in hardware as positive going or . . negative going.

	RESISTIVE INPUT		VOLTAGE INPUE	
	Negative going	Positive going	Negative going	Positive going
OK / No Operation	OPEN	SHORT	12VOLTS	0 VOLTS
On fault/Operation	SHORT	OPEN	O VOLTS	12 VOLTS

1. LLOP: refer Analogue input write up.
2. V Belt: On fault V- Belt led is ON and Auto Fault Shut Down process starts.
3. Fuel : On fault V- Belt led is ON and Auto Fault Shut Down process starts.
4. Overspeed: On fault RPM H led is ON and Auto Fault Shut Down process starts.
5. Underspeed: On fault RPM L led is ON and Auto Fault Shut Down process starts.
6. Cabin Temperature: On fault CAN T H led is ON and Auto Fault Shut Down process starts.
7. Remote Start: On Operation, Genset starts Irrespective of Mains and can only be shutdown by Remote shutdown.
8. Remote shutdown: On Operation Genset is shutdown which was stared due to Remote Start.
9. E Stop: On Operation Stop Genset Immediately in all Modes.
10. Radiator Water Level: On fault RAD LEVEL led is ON and Auto Fault Shut Down process starts.
11. Mains Display: On Operation displays Mains parameter when Genset is in AUTO OFF or MANUAL OFF.
12. By Pass Mode: The mode is to only observe the performance of the Genset. There is no control on the Controller on Genset operation. Can switch to this mode from AUTO OFF or MANUAL OFF state. After switching to this mode Genset can be started externally independent of Controller.
13. & 14. Extra 1& Extra 2 : both can be configured as Fault or operation input.

4. DIGITAL OUTPUTS

a) All digital outputs are designed to drive 12 V PCB mounting. . Relays.

b) All digital ouputs can be configured to go high or low on . . Operation.

Following relays will be made ON, sequentially while starting the Genset. All the relays will be made ON/OFF with predetermined time settable through interaction.

1. Preheater:
2. Fuel Solenoid:
   Two options using interaction 1. Energize to ON ---- Normally off. Will be. . ON & remain ON till the Genset is ON.
   2. Energize to OFF---- Normally off. Will be .. . ON for 15 seconds when to turn OFF the . Genset. Then it remains OFF only.
3. Crank: Crank after Fuel Solenoid is ON. Minimum on time of 2 seconds. Maximum of 4 seconds. Cranking stops within 2-4 seconds if Oil P is developed during this time. If Oil P ,above warning, is not developed after certain no of crank attempts as set in Interaction then Start fail fault is declared.
4. Mains CB: ON /OFF the Mains contactor.
5. Genset CB: ON /OFF the Genset contactor.
   Both these contactors are requested to be interlocked.

The following relays do not operate sequencially but after the respective events occurances.

6. Hooter: To Indicate Warning hooters Intermittent, for Trip & Fault continues hooter. Hooters can be made OFF after certain predetermined time.
7. Tower Light: ON / OFF the tower light with respect to Real Time Clock.
8. AC On:TO ON /OFF the Air Conditioner ,depending upon cabin temperature.

9 to 14 – not assigned at present . Can be configured as desired.

5. LED's

A) Switch Led's :

1. **Auto**: ON when in **Auto** mode
1. **Manual**: ON when in MANUAL mode
2. **Test**: ON when in TEST mode
3. **Start / Stop**: ON for Manual Start and Stop mode
4. **Mains Ccont On / Off**: LED on when Mains Contactor is ON
5. **Genset Cont On/Off**: LED on when Genset Contactor is ON
6. **Fault Reset**: ON when Fault is reset

B) Led Output

1. Mains: Mains is present(blinking for check mains in Start Operation)
2. DG On: Generator is ON(blinking for manual start and Autostart, AFSD)
3. Common Fault: ON due to fault fuel low (digital i/p), Under voltage, Over voltage.
4. Battery : ON for 12V supply.(Blinking for warning)

C) Fault Leds

1. **Llop**: On when oil pressure is not developed.
2. **V-Belt**: On when **V- Belt** fault is occurred.
3. **Rpm H(Overspeed):** when Genset RPM is higher than the upper limit
4. **Rpm L(Underspeed):** when Genset RPM is low than the lower limit
5. **E Stop**: On when Emergency stop is Applied
6. **Rad Leval**: On when the Water level in the Radiator is below lower limit.
7. **Can T H**: On when the CANOP temperature is higher than the upper limit
8. **Cool T H**: On when the coolant temperature is higher than upper limit
9. **Mnt Od**: On when there is Maintenance over due.
10. **Start F**: On when Generator is Failed to Start.
11. **Stop F:** On when Generator is Failed to Stop.

6. ANALOG INPUTS – (Optional)

Temp & Other Parameters

a) Accuracy of measurement on all analogue i/p will be < 1%.
b) All analogue inputs can be enabled or disabled through interaction except EB voltage & Current sense.
c) Warning and Trip value can be changed using interaction., intermittent Buzzer & led blinking on warning , continuous on trip.

1. Cool T (RTD type): NTC characteristic, 10 point calibration (93 Ohms -- 145 ºC , 1975ohm--0ºC).
2. Oil T (RTD type): NTC characteristic, 10 point calibration, (93 Ohms -- 145 ºC, 1975ohm-- 0ºC),.
3. Can T (RTD type): NTC characteristic, 10 point calibration, (93 Ohms --- 145 ºC, 1975ohm---0ºC),.
4. Fuel Level (RTD type): PTC characteristic, 2 point calibration, (10 Ohms – 0% , 190ohm--100%),.
5. Oil Presuure(Previously Alt T) (RTD type): PTC characteristic ,10 point calibration, (30 ohm-1 bar , 97ohms—8 bar), 1.5 bar Warning and 2.0 barTrip

Used for cranking attempts .

If Oil P is developed above warning limit, after min 2 seconds of cranking , it is assumed that the cranking is complete . The crank is disconnected. If not another cranking is attempted. After 4 nos of unsuccessful attempts start failure is declared.

6. Voltage Input (0 to 5 Volts): 2 point calibration. UV(2& 1.5 V)/OV 4.0& 5.0 V)trip
7. Extra mV (0 to 5 Volts) Same as above.
8. mA (4 to 20 milli Amps): 2 point calibration. UV(8& 6mA)/OV (16& 18mA)trip
9. Extra milli Amps Same as above
10. Battery Voltage: Battery supply 12V. Warning 10V and Trip 9V. Selection of Battery 12V/24V/36V using Interaction.

11. BTS voltage (to be tested on 0-5 V with resistor adjustment): 60 Volts. BTS low limit can be changed through interaction. Further actions to start /stop the be decided later.
12. RPM Measurement RPM 1 & 2: RPM is calculated using frequency, also can calculated using sense through speed sensor . Calibration is hard coded. 3 KHz = 1500 rpm. Warning & trip setting through interaction.

EB Voltage & Current Sense

a) Calibration through interaction
b) UV/OV ---Warning and Trip can be set using interaction
c) External CT X : 5 ratio , X can be upto 499.
13 ,14 , 15 : EB Voltage R,Y,B: These are Electricity Board R , Y, B phase voltages & are used for power calculation & Voltage Sanity. R phase is used for frequency calculation

16, 17 ,18 : Genset Voltage R,Y ,B : These are Generator R, Y, B phase voltages
& are used for power calculation & Genset Sanity. R phase voltage used for frequency

19,20,21 :Genset Current R, Y ,B : Sensed by Shunt, 5 A = full load, CT ratio max 499, used for power calculation.
.

7. FUTURE ADDITIONS

1. Mains 3 Phase, Power measurement.
2. Best Phase Selector

2 out of 3
1 out of 3

3. Cyclic Operations
4. Auto Synchronising Module.

SHIDORE MICROSYS
An ISO 9001 - 2008 Company

MICROSYS HOUSE
Plot No. 15, S. No. 98, Bhusari Colony, Paud Road, Kothrud, Pune 411 0038.
Phone : 91-20-25283594, 25283572
Email : info@shidoremicrosys.com