50 YEARS

EXPLOSION PREVENTION AND FIRE EXTINGUISHING SYSTEM FOR TRANSFORMERS AND REACTORS

CTR

CTR MANUFACTURING INDUSTRIES LTD

INCREDIBLE SOLUTIONS

CTR Manufacturing Industries Ltd established in 1964 are market leaders in the manufacture and marketing of Engineering and Electronic products with manufacturing facilities at Pune, Aurangabad and Nashik in India. After Sales Service Offices nationwide and Associates worldwide.

CTR has quality system certified as per ISO 9001:2015.

On Load Tapchanger business started in 1964 with technical know-how from English Electric UK. Further several models were developed extending range from 11 kV to 132 kV and 170 kV neutral end application.

Introduced **Intank On Load Tapchangers** in 1996 with technology from Elin OLTC Austria. Manufactured and sold more than 10000 tapchangers from 11 kV to 400 kV and 10 MVA to 500 MVA which are working satisfactorily all over India and worldwide. Several new models are also developed.

Vacuum OLTC for dry type transformers are available upto 33 kV.

Selector switch type tapchangers are also available leading to compact and economical solution.

Pressed Steel Radiators for oil natural air natural and oil natural air forced cooling of oil in a transformer.

FOR TRANSFORMER / REACTOR TANK PROTECTION

FOR TRANSFORMER TANK, OLTC / CABLE BOX PROTECTION

FOR HIGHER RATING TRANSFORMER / REACTOR TANK PROTECTION
WITH PLC MIMIC AND SCADA COMPATIBILITY

CE 1282 Ex

TYPICAL INSTALLATION

On receipt of required activating signals, depressurizing commences within 13 ms by draining of a predetermined quantity of oil. Simultaneously Nitrogen is injected under pressure at a predetermined flow rate to create a stirring action thereby bringing the temperature of top oil surface below ignition point.

Additionally in case of external fire, it is extinguished within 30 seconds maximum. Nitrogen gas occupies the space created by oil drain and acts as an insulating layer between the top layer of oil in the transformer tank and oxygen in the atmosphere.

Transformer Conservator Isolation Valve (TCIV) blocks the passage of oil and isolates conservator oil thereby preventing conservator oil drain during operation and preventing escalation in the event of fire.

FEATURES

- Reliable
- Dedicated system
- Saved over 15200 MVA of transformers from explosion worldwide
- System can be installed on existing transformers, reactors at site with minimal outage period
- System can be tested on energised transformers, unlike the other systems
- Multi signal activation, eliminates possibility of mal-operation
- Patented in over 80 countries
- Low investment compared to other systems
- Minimal post-fire and no secondary damage
- Low maintenance and running cost compared to other systems
- Full proof design to avoid ingress of nitrogen due to climatic changes into energised transformer
- Suitable for indoor, outdoor and unmanned substations
- Models available to protect OLTC and oil filled cable box
- Proven even to protect bushing explosion and fire
- Extinguishes external fire in bushing and/or radiator also
- Back up provision ensures nitrogen injection for fail safe operation
- Suitable for oil filled generator / furnace / rectifier / power transformers and reactors / Transformers for solar application
- Approved by leading transformer manufacturers and utilities worldwide
- Complies with NFPA
- CE ATEX certified

AUTO EXPLOSION PREVENTION MODE

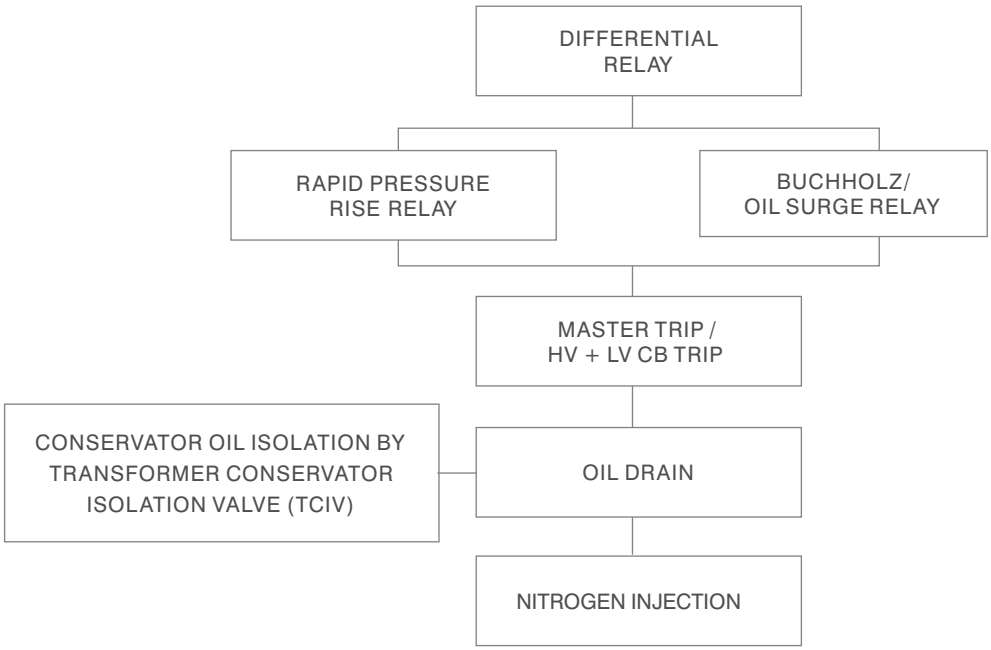
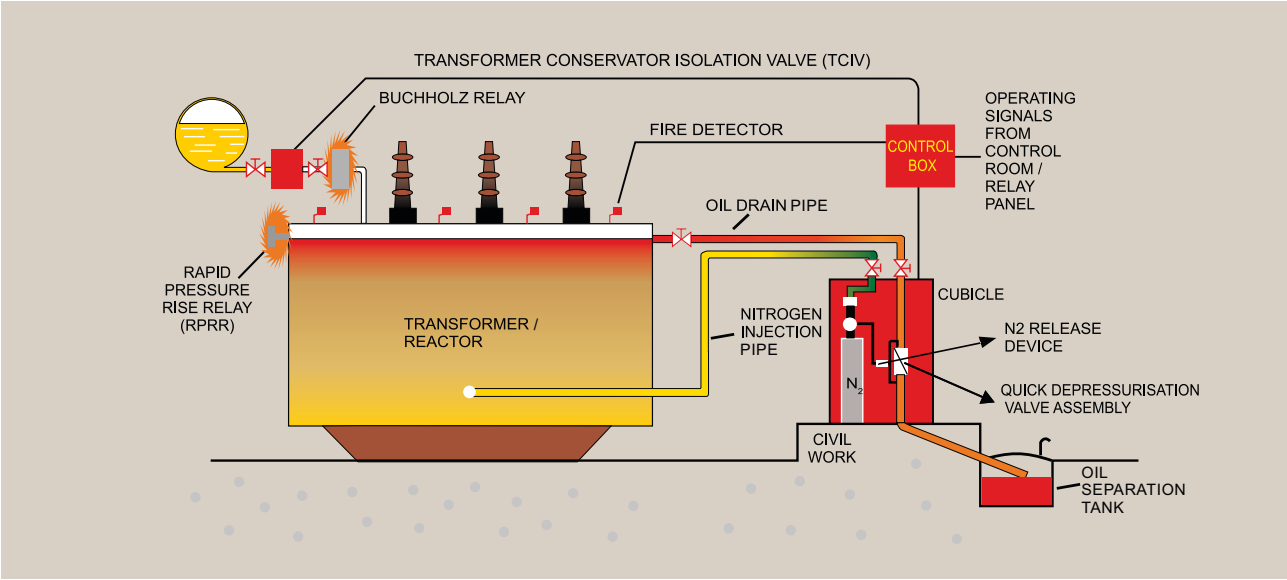


EXHIBIT 1A

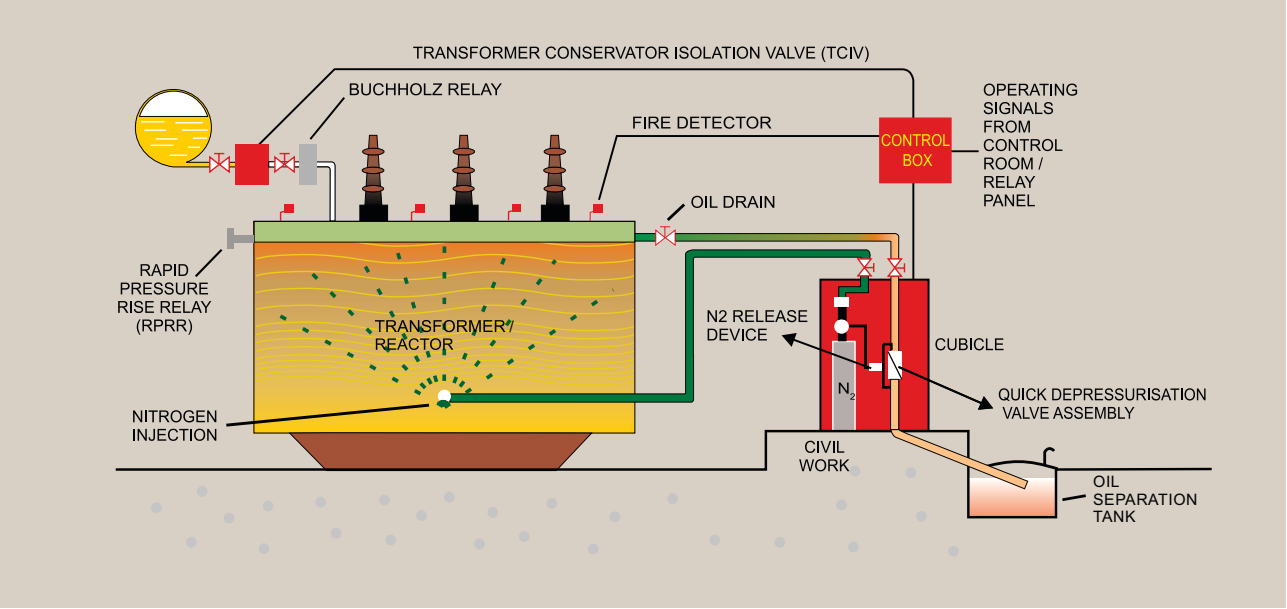


Internal heavy faults result in short circuit and consequent imbalance of input and output current leads to operation of differential relay. Faults lead to consequent oil surge / turbulance in the transformer tank leading to operation of Rapid pressure rise relay and / or Buchholz relay.

Immediate reduction of pressure is achieved by partially draining oil from the top of the transformer tank.

Conservator oil is isolated simultaneously due to operation of TCIV. The drained oil is collected in the covered oil pit / tank. Refer to exhibit 1A.

EXHIBIT 1B



Simultaneous with oil drain, nitrogen gas is injected at a predetermined flow rate and pressure from the bottom side valves of the transformer tank.

Stirring action by the nitrogen gas of the transformer oil reduces the temperature of the top layer of the oil eliminating the possibility of fire on the top surface of the oil.

Continuous nitrogen injection for upto 45 minutes cools the oil to ambient temperature.
Refer to exhibit 1B.

AUTO EXTINCTION MODE

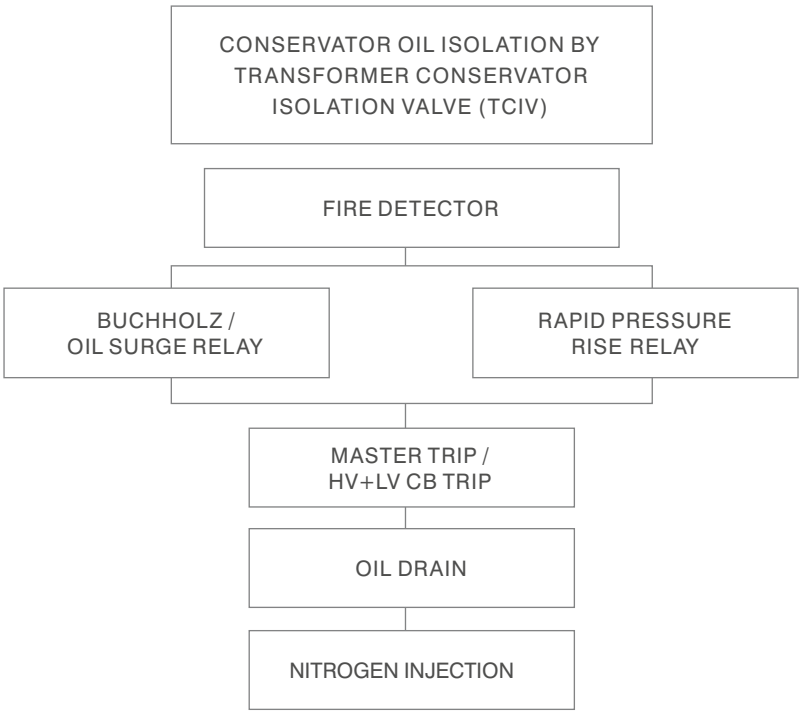
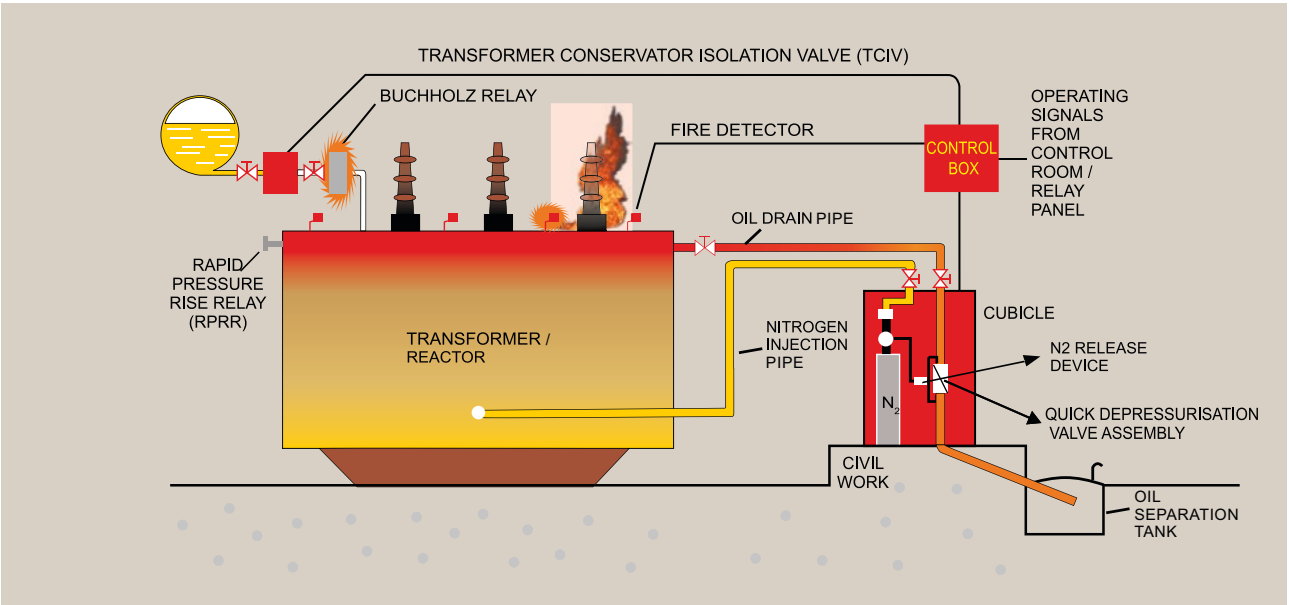


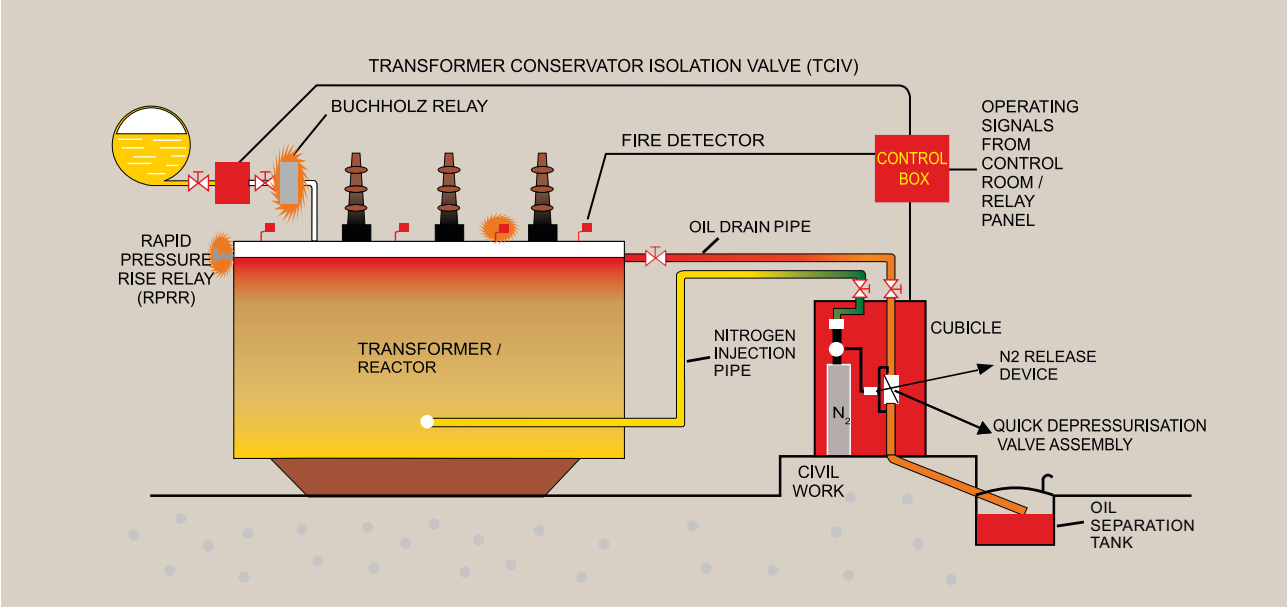
EXHIBIT 2A



System will also operate in case of bushing failure or transformer tank rupture.
Since oil from conservator will flow at an abnormal rate, resulting in operation of TCIV, which isolates the conservator oil, preventing aggravation and spread of fire.

Consequently buchholz relay operates due to non availability of oil in the relay.
Refer to exhibit 2A.

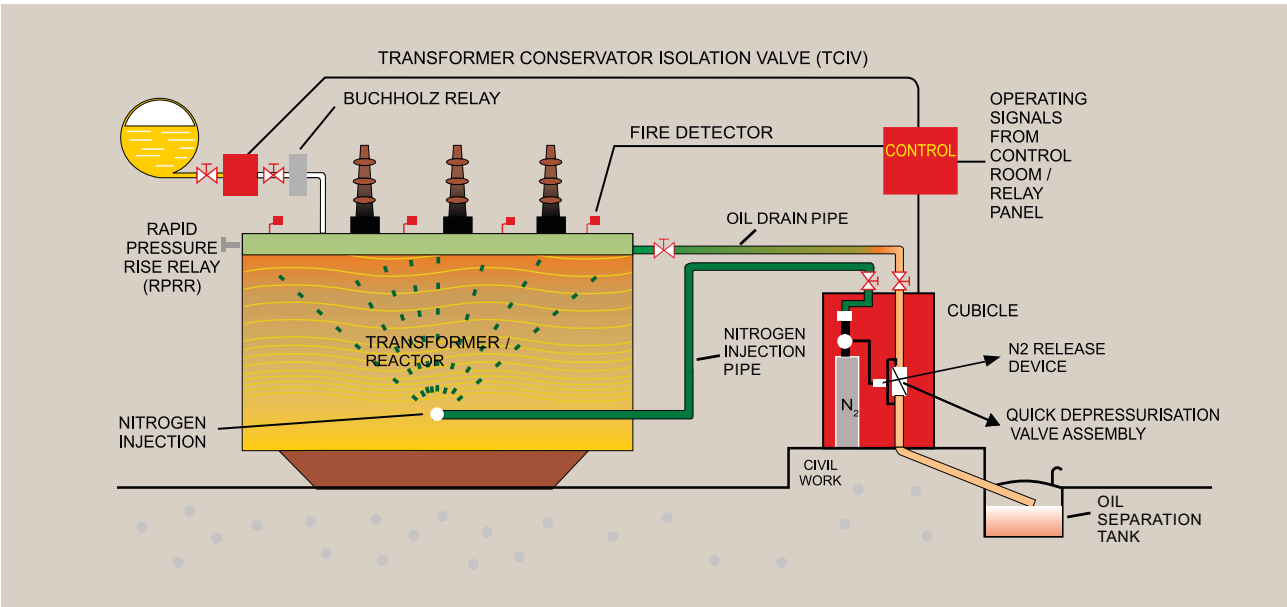
EXHIBIT 2B



Upon receipt of system activation signals, immediate draining of top layer of oil in the transformer tank commences, reducing any pressure in the transformer tank.

The top layer of oil gets drained and collected in a covered oil pit / tank . Refer to exhibit 2B.

EXHIBIT 2C



Simultaneous with oil drain, nitrogen gas is injected at a predetermined flow rate and pressure from the bottom side valves of the transformer tank.

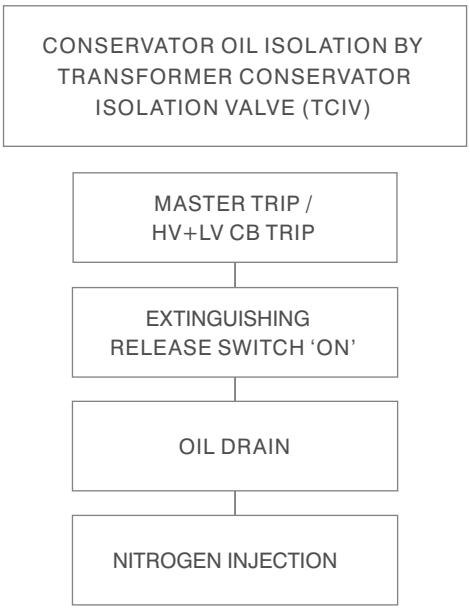
Stirring action by the nitrogen gas of the transformer oil reduces the temperature of the top layer of the oil extinguishing any fire on the top surface of the oil.

Continuous nitrogen injection for upto 45 minutes cools the oil to ambient temperature. Refer to exhibit 2C.

REMOTE AND LOCAL MANUAL MODE

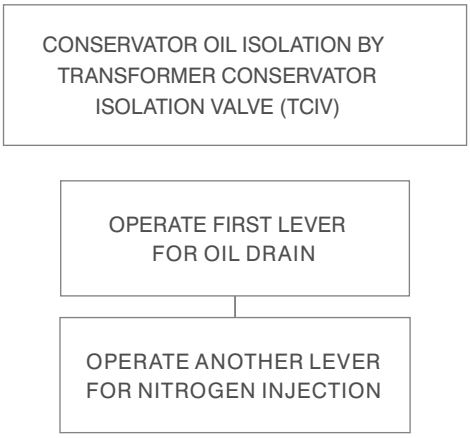
REMOTE MANUAL MODE

In case of an emergency, the system can also be operated in remote manual mode by breaking the glass window provided on the control box and by turning on extinguishing release switch to ‘ON’ position.

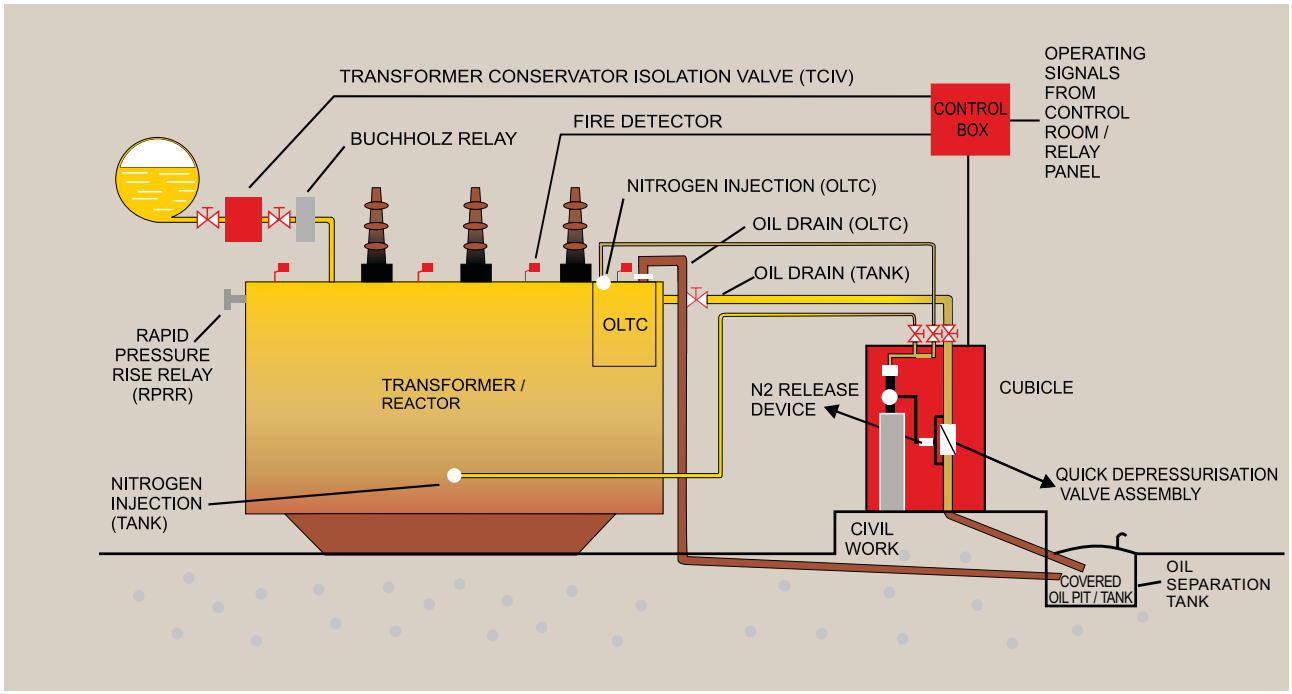


LOCAL MANUAL MODE

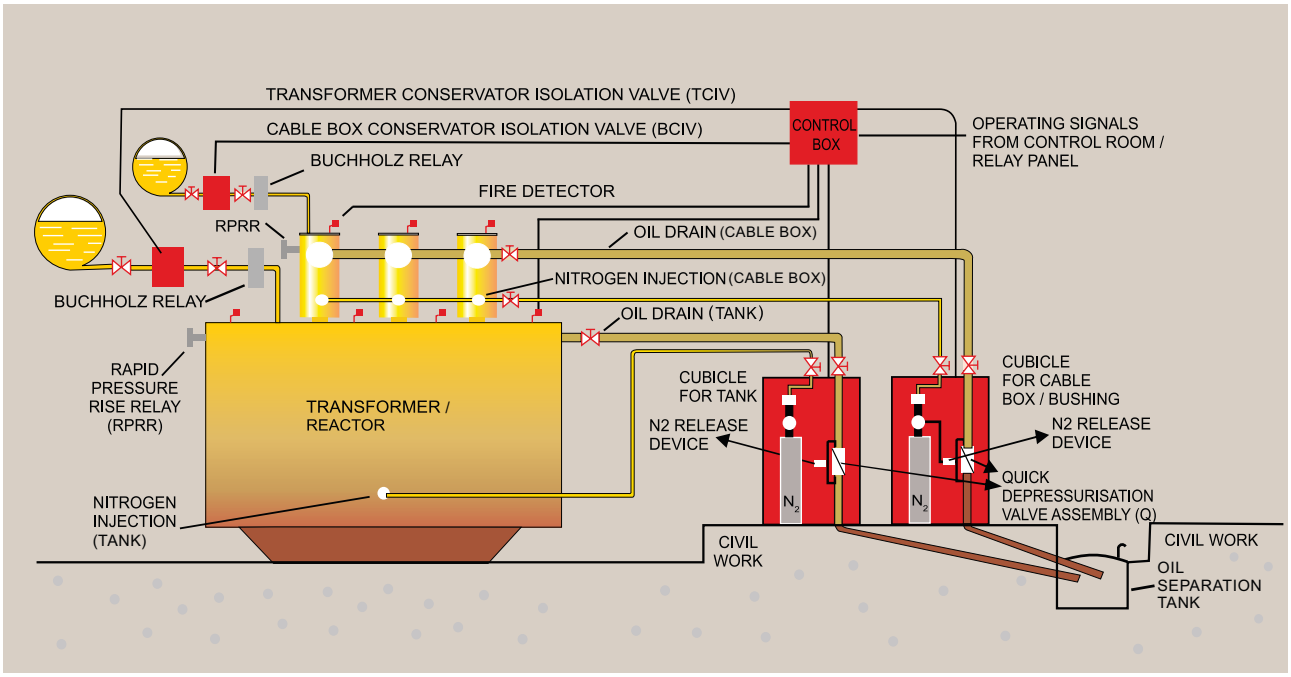
In case of an unlikely event of failure of power source, the system can still be operated manually from the cubicle.



OPTIONAL OLTC PROTECTION LAYOUT



OPTIONAL CABLE BOX PROTECTION LAYOUT



INSTALLATION AND COMISSIONING

Service engineers are available for supervision of system installation, commissioning and training. CTR warranty is valid, if system is commissioned by CTR representative authorised in writing.

Worldwide representatives are available for spares and service. Marketing enquiry questionnaire form PTFS 1005 should be entered completely for prompt response and offering of most appropriate model.

Operation and maintenance manual is supplied in English or specifically requested language. Please also specify number of copies required both in digital and hard format and to whom these should be delivered.

TESTIMONIALS

EDL, LAOS

LAO PEOPLE'S DEMOCRATIC REPUBLIC
PEACE INDEPENDENCE DEMOCRACY UNITY PROSPERITY

Electricite du Laos
Transmission and Substation Development Department
230kV & 115kV Transmission Line and Associated
Substation Project

No.859./EDL.TSD.TNK
Vientiane Capital, Date. 16 OCT 2018

PERFORMANCE CERTIFICATE

TO WHOMS OEVR IT MAY CONCERN

This is to certify that CTR Manufacturing Industries Ltd., India make Nitrogen Injection Explosion Prevention and Fire Extinguishing System bearing sr. nr. 15:55623 installed on our 100 MVA, 230/115 kV transformer at THABOK substation Laos has operated successfully and saved the transformer from Explosion and subsequent fire during an internal fault in the transformer on 11 June 2018 at 01:00 hrs. Transformer Conservator Isolation Valve (TCIV) / PNRV of CTR system operated during system operation and prevented oil flow from conservator to transformer tank.

The system operated in Auto Prevention mode upon receipt of signals from Differential Relay, Rapid Pressure Rise Relay/ Buchholz Relay trip and Master Trip Relay and depressurized the transformer tank before pressure build up. Operation of the system is as per approved logic. Performance of CTR system is excellent.

The said transformer is re-energized after replacing the bushing on 30 September 2018.

Thanking You,
Yours faithfully

Phonepasouth SOUKHASEUM
Dy. Project Manager
Electricite Du Laos (EDL)

Lao-Thai Friendship Road, P.O BOX 309, Thongkang V. Sisattanak D. Vientiane Capital Lao P.D.R
Tel: (856-21) 316133; 316094 Fax: (856-21) 316188; 263794 Email: edlgmo@edl.com.la,Website:WWW.edl.com.la

PHILIPPINES

MIESCOR / ASIAPHIL – ROMAGO JV

MIESCOR
5th Floor Renaissance Tower 1000,
Meralco Avenue, Pasig City
Tel. No. (632) 635-5801 to 10
Fax No. (632) 635-5811

August 07, 2013

CERTIFICATE

Successful Operation of CTR Make Transformer Explosion Prevention System

This is to certify that CTR Manufacturing Industries Limited India make Transformer Explosion Prevention System bearing serial number 10:55218 commissioned on 230/69Kv, 100MVA transformer of Alstom (AREVA) make at our Clark Development Corporation substation Philippines, operated successfully in Auto Prevention mode as per approved scheme during internal fault in the transformer on 06th April 2013 and saved the transformer from explosion and subsequent fire.

After the internal fault, following relay signals received on CTR control panel and immediately transformer tank depressurized by quick depressurization valve by operation of heavy duty lifting magnet and subsequently conservator oil was isolated by auto operation of Transformer Conservator Isolation Valve (TCIV), and Nitrogen gas was injected into the transformer tank. Due to the correct and timely operation of CTR Transformer Explosion Prevention System, our 100MVA transformer number 3 at Clark sub-station has been saved from explosion.

1

PHILIPPINES

MIESCOR / ASIAPHIL – ROMAGO JV

MIESCOR
5th Floor Renaissance Tower 1000,
Meralco Avenue, Pasig City
Tel. No. (632) 635-5801 to 10
Fax No. (632) 635-5811

Summary of transformer protection operation observed on relay panel:

- Differential Relay
- Rapid Pressure Rise Relay (Sudden Pressure Rise Relay)
- Buchholz Surge Relay
- Master (86) Relay

Summary of operation signals observed on CTR Control box Panel:

- Differential Trip
- Buchholz Trip
- Transformer Trip
- TCIV Closed

CTR Make system was installed on 12th March 2011. Performance of CTR make Transformer Explosion Prevention system is very satisfactory.

REYNALDO E. BORCES

Project Director

2

500 MVA TRANSFORMER

pstcl Punjab State Transmission Corporation Ltd.
Office of Addl. S.E. 400/220 KV S/S Dhuri (Bhalwan) Email: srxen-pm-dhuri@pstcl.org

G2/411

Date: 25.7.2016

TO WHOM SO EVER IT MAY CONCERN

Performance certificate

is to certify that CTR Manufacturing Ind. Ltd. Pune, India make Transformer sion Prevention and Fire Extinguishing System serial number 11:55141 which commissioned on 21.08.2012 installed on 500MVA, 400/220Kv AREVA make former bearing (serial numbers T-6865/2,B-30650) at our 400Kv S/S, Dhuri ge: Bhalwan), PSTCL Punjab, operated successfully in Auto Prevention mode during the internal fault occurred on 1.10.2015 and saved the transformer from the explosion and subsequent fire.

On receipt of signals CTR system gets operated immediately and immediately depressurised the transformer tank, subsequently Transformer Conservator Isolation Valve (TCIV) blocked the conservator oil successfully and Nitrogen injection was injected in the transformer tank. Due to the correct and timely operation of CTR system, our 500 MVA transformer ICT1 has been saved from the explosion.

Performance of CTR make Nitrogen Injection Transformer Explosion Prevention and Fire Extinguishing System is very reliable.

For PSTCL

SSE (PSTCL)
400 Kv/S DHURI
at Vill. BHALWAN.

c/s

Addl. S.E.
400 K.V. S/S P.S.T.C.L.
DHURI (BHALWAN)

EXTERNAL BUSHING FIRE DUE TO LIGHTNING STRIKE

RP-Sanjiv Goenka Group
Growing Legacies

CESC LIMITED

CON:M:0719:UN.

20th February, 2012.

M/s. CTR Manufacturing Industries Ltd.,
659, Kalikapur Road, E.M. Bye-pass,
Kolkata - 700 099.

Dear Sirs,

Performance of 'CTR' Make NIDS

We are pleased to inform that on 15/02/2012 at about 10-00 pm Transformer T1 of 20 MVA at South City Distribution Station caught fire at the bushing due to some external fault. At that moment there was heavy rain with lightening and storm. This Transformer was protected by your NIDS, Sr. No. 27:50081, which was commissioned on 31/01/2008. During this bushing fire, system operated successfully and saved the Transformer from secondary damages. During system operation, conservator oil was also blocked by successful operation of TCIV. We have experienced the reliability and importance of your system.

Yours faithfully,

MANAGER (MECHANICAL)
CONSTRUCTION DEPARTMENT

GMS

CESC Limited, PODDAR COURT, 18 Rabindra Sarani, Kolkata-700 001, Telephone: 2225-3550 Fax: (033) 2225-3704
(Regd. Office: CESC House, Chowringhee Square, Kolkata - 700 001, India) Web: www.cesc.co.in

SOLAR FARM

Clean Max Enviro Energy Solutions Pvt. Ltd.

CleanMax SOLAR

Ref.No.:

Date: May 2018

TO WHOMSOEVER IT MAY CONCERN

This is to certify that CTR make Transformer Explosion Prevention and Fire Extinguishing System sr. nr.17:55556 installed on 66/11 KV 24 MVA CGL make transformer sr. nr. NF7945 at 66 KV Tirragi Substation of Cleanmax Solar operated successfully in Auto Prevention Mode on 06.04.2018 in view of internal failure on receiving Differential Trip, Buchholz Trip and Transformer Trip signals. Oil drained into oil collection tank and Nitrogen injected into transformer tank as per requirement. Transformer conservator Isolation Valve (TCIV) isolated conservator oil from transformer tank. CTR system operated as per logic and prevented possible transformer tank explosion and damage to secondary equipments.

Clean max Solar is satisfied with the reliability and performance of CTR product and services provided to Cleanmax Solar farm.

For Clean Max Enviro Energy Solutions Pvt. Ltd.
Authorised Signatory

400 KV REACTOR OPERATION IN AUTO MODE

ಕರ್ನಾಟಕ ವಿದ್ಯುತ್ ಪ್ರಸರಣ ನಿಗಮ ನಿಯಮಿತ
KARNATAKA POWER TRANSMISSION CORPORATION LIMITED
Corporate Identity Number (CIN): U40109KA1999SGC025521

EEE/TL & SS/NEL/AEE -1/GF-37/2018-19/ 2011
Encl:
☎: 080 – 27723454(Office / Fax)
E-mail: nel_smd1@rediffmail.com
eetlssnelamangala@gmail.com

Office of the:
Executive Engineer Elecl.,
TL & SS Division,
KPTCL, Nelamangala.
Date: 03.10.2018

To Whomsoever it may concern

CTR make NIFPS system bearing Sl.Nos 15:55263, 15:55264, 15:55265, were supplied and successfully commissioned on 22.04.2017 for Hassan; Talaguppa and Hiriyur-1 line reactors installed at 400kV Receiving Station Nelamangala. On 23.09.2018 @ 16:27 Hrs the NIFPS system bearing Sl.No 15:55264 provided for Talaguppa line reactor has successfully operated for external fire due to failure of 400kV 'B' phase bushing. As per the scheme the oil from the main tank drained up to top drain valve to the oil soak pit. Nitrogen was injected in reactor tank. However, oil in the conservator is blocked by TCIV valve.

We are satisfied with the reliable performance of CTR make NIFPS.

Executive Engineer (Elec.),
TL & SS Division, KPTCL
Nelamangala

OPERATION IN REMOTE MANUAL MODE

MAHARASHTRA STATE ELECTRICITY TRANSMISSION CO. LTD
400 KV R.S.(O&M) DIVISION, DHULE

MAHATRANSCO

OPERATION IN LOCAL MANUAL MODE

ATUL LIMITED
Infrastructure Unit Atul Complex
Atul 396 020, Gujarat, India
Telephone : +91(2632) 233261, 230000 Fax + 91 (2632) 233027, 233619
Web site : www.atul.co.in

To,
CTR Manufacturing Industries ltd.
Nagar Road,
Pune: 411014

Subject: Utilization of CTR makes Explosion Prevention and Fire Extinguishing System.

This is to inform you that on 23.06.2018 at 09:30Hours, due to external fire 66/11KV, 12.5MVA transformer caught fire at our 66KV substation. Fire was extinguished in 40 seconds by manual operation of CTR system, bearing serial number 17:55202 as operator was in substation, instead going to control room for remote electrical operation, operator operated system in local manual mode from Fire Extinguish Cubicle. Transformer Conservator Isolation Valve (TCIV) closed as soon as oil drain started and conservator oil was blocked to enter into the transformer main tank.

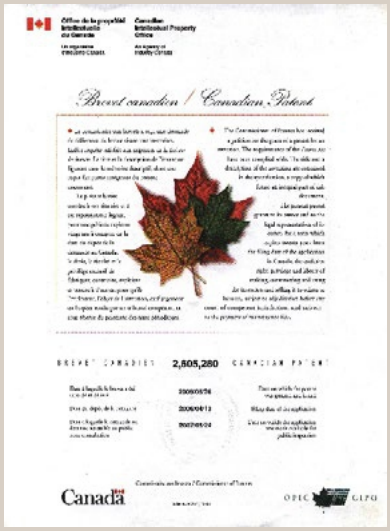
The performance of CTR product "Explosion Prevention and Fire Extinguishing System" is appreciable.

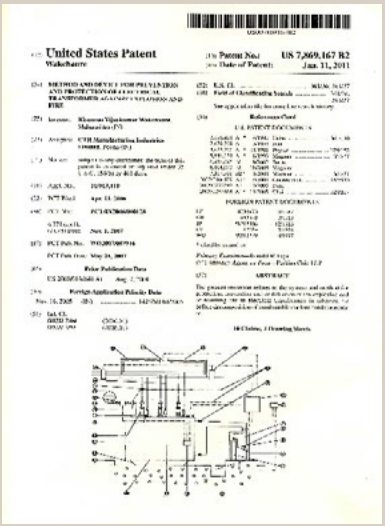
Thanking you
For Atul Ltd

Manish Lad
Sr. Manager

LALBHAI GROUP
Atul Limited is incorporated in India. Registered Office : Ashoka Chambers, Rasala Marg, Ahmedabad 380 006 Gujarat, India

SOME INTERNATIONAL PATENTS





TECHNICAL HIGHLIGHTS

Depressurisation during explosion prevention	:	Commences before static pressure build up and consequent explosion
Fire Extinguishing period for additional Backup system	:	Maximum 30 seconds from commencement of N2 injection
Fire detector heat sensing temperature	:	141°C
Transformer conservator isolation valve (TCIV)	:	Supplied with flow rate depending upon transformer and conservator pipe size.
Control Box	:	48V DC / 110V DC / 125V DC / 220V DC / 250V DC and 110V AC / 230V AC
Cubicle	:	110V AC / 230V AC

Cubicle

Transformer rating	Dimensions in mm			Weight in Kgs
	L	B	H	
250 MVA and above	1600	600	1900	600
10 MVA to 249 MVA	1200	500	1900	500
2 MVA to 10 MVA	1200	500	1700	450
Below 2 MVA	1200	500	1200	350

H = Height includes 100 mm for Base

Control Box

Types	Dimensions in mm			Weight in Kgs
	L	B	H	
Electro-mechanical	500	320	700	45
PLC	500	320	700	40
PLC with mimic	500	320	700	40
PLC with SCADA	500	320	700	40

Dimensions indicated are minimum

SCOPE OF SUPPLY / WORK

CTR :	Basic System	: Cubicle
		: Control box
		: Transformer conservator isolation valve (TCIV)
		: Required number of fire detectors
		: Signal box and Fire survival cable
	Add on Accessory items, as required	: Fire resistant low smoke (FRLS) cables
		: Pipe connections between Transformer and Cubicle
		: Pipe connections between cubicle and oil separation tank
TRANSFORMER / REACTOR MANUFACTURER / BUYER :	On transformer	: Oil drain opening
		: Nitrogen injection openings
		: Brackets for Fire detector fixing
		: TCIV fixing arrangement
		: Signal box fixing arrangement
USER :	Other	: Civil work for cubicle
		: Civil work for piping
		: Civil work for Oil pit / Oil separation Tank
		: Oil separation tank (optional)
		: Potential free contacts in relay panel
		: Power supply
		: Oil for topping up transformer / reactor

MK ENQUIRY QUESTIONNAIRE FORM

Transformer Explosion Prevention and Fire Extinguishing System

CUSTOMER

Customer : | Enquiry Ref :

Work Order Nr/Tender Nr : | Quantity :

End User :

TRANSFORMER / REACTOR DETAILS

Manufacturer | Trs./Reactor Sr. Nr. :

MVA / MVAr Rating : | Voltage Ratio :

G.A. Drg Nr. :(Enclosed) | Top cover Drg Nr. : (Enclosed)

Oil Qty in tank : ☐ Lts | Oil Qty in Conservator : ☐ Lts

D.C. Supply available in Control Room : 220V ☐ 125 V ☐ 110 V ☐ 48 V ☐ OTHER ☐ V

Single ϕ A.C. Supply available near Transformer : 230 V ☐ 110 V ☐ 50 Hz ☐ 60 Hz ☐

Single ϕ A.C. Supply available in control room : 230 V ☐ 110 V ☐ 50 Hz ☐ 60 Hz ☐

Protection Required : Main Tank only ☐ Main Tank + OLTC (with / without filter) ☐ Main Tank + OLTC +Cable box (HV/LV) ☐

Confirm availability of spare contacts in relay panel :

Differential Relay trip ☐	PRV Trip ☐ Tank	Buchholz trip ☐ Tank	Restricted Earth fault relay trip ☐
1 Nr. NO Potential free	1 Nr. NO Potential free ☐ Cable Box	1 Nr. NO Potential free ☐ Cable Box	1 Nr. NO Potential free
Winding temp. Indicator trip ☐ 1 Nr. NO Potential free	Master relay (86) Trip ☐ 1 Nr. NO Potential free	Oil temp. Indicator trip ☐ 1 Nr. NO Potential free	HV circuit breaker & LV circuit breaker trip, ☐ 1 Nr Each, NC Potential free
OLTC oil surge relay trip ☐	Rapid Pressure Rise Relay ☐ Tank		
1 Nr. NO Potential free	1 Nr. NO Potential free ☐ Cable Box		

If numeric relay for Differential relay : Self reset ☐ Manual reset ☐

If Transformer tank RPRR : Self reset ☐ Manual reset ☐

If Cable Box RPRR : Self reset ☐ Manual reset ☐

Remarks :

Main Dimensions of tank :

L = ☐ mm

B = ☐ mm

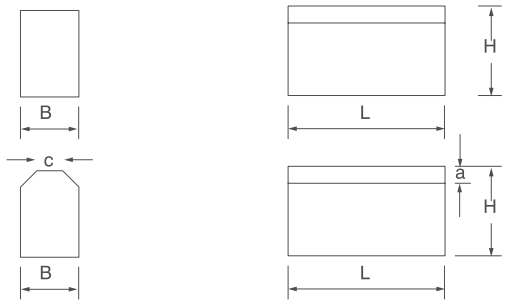
H = ☐ mm

a = ☐ mm

c = ☐ mm

Type A ☐

Type B ☐

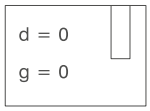


Builtin onload Tapchanger : Yes ☐ No ☐

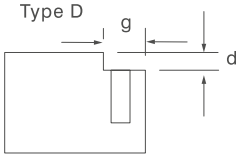
If yes : Arrangement

Dimension : d = ☐ mm, g = ☐ mm

Type C



Type D



Filter unit : Yes ☐ No ☐

Pressure Relief Device : Yes ☐ No ☐

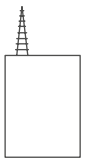
Conservator pipe dia : ☐ Tank ☐ Cable Box (mm)

Conservator pipe angle : ☐ Tank ☐ Cable Box (Degree)

TRANSFORMER / REACTOR DETAILS

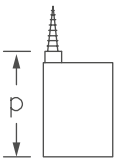
Arrangement of Bushing :

a)



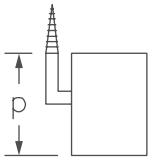
HV ☐
LV ☐
TV ☐
others ☐

b)



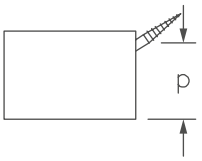
HV ☐
LV ☐
TV ☐
others ☐
p = ☐ mm

c)



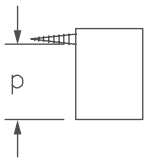
HV ☐
LV ☐
TV ☐
others ☐
p = ☐ mm

d)



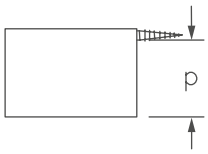
HV ☐
LV ☐
TV ☐
others ☐
p = ☐ mm

e)



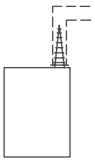
HV ☐
LV ☐
TV ☐
others ☐
p = ☐ mm

f)



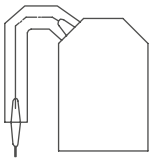
HV ☐
LV ☐
TV ☐
others ☐
p = ☐ mm

g)



HV ☐
LV ☐
TV ☐
others ☐

h)



HV ☐
LV ☐
TV ☐
others ☐

Cooling details :
If of type,
Nr. of pumps : (Main/Standby)
KW / HP :
Head :
Flow :
Conservator to tank back flow during pump switched off (Lits/minute) :

SPECIFICATION / REQUIREMENT

Copy of Specification to be attached : ☐
Specification Nr. _____

System Required using microprocessor : ☐ OR
System required with Potential ree contact: for SCADA / SAS ☐

If with microprocessor specify protocol : ☐ PLC ☐ / PLC + HMI ☐ / PLC+HMI+SCADA compatibility

Any specific requirement (cable type etc.) :

INSTALLATION

Installation : New ☐ Post ☐ Unmanned Substation ☐
Scope : CTR ☐ Purchaser ☐

Dist. from Trs. to Control Room through Cable Trench : ☐ mtrs
Dist. from Relay Panel to Control Room through Cable Trench : ☐ mtrs

Valve Schedule Drawing to be attached : ☐ Drg. Nr. :

Availability of Valves :
Between Conservator and Buchholz Relay : Available ☐ Not Available ☐ **
Between Buchhloz Relay and Transformer : Available ☐ Not Available ☐ **

** If valve not available enclose detailed pipe drawing for Tank and conservator alongwith buchholz valve flange details.

Oil pit / tank : Available ☐ Not Available ☐ Dist. from Trs : ☐ mtrs
Dimensions (L X B X D) mm : Capacity : ☐ Lts
Size of pipe connecting Trs. to oil pit / tank : ☐ mm
Civil work required for Plinth ☐ Oil pit ☐ Oil pit for tank ☐ Safety wall ☐

Site Details:
Sub-station layout drawing to be attached ☐ Drg. Nr.
Sub-station foundation drawing to be attached ☐ Drg. Nr.
Sub-station cable trench drawing to be attached ☐ Drg. Nr.

GENERAL

Manuals : Quantity in digital ☐ Nrs. Quantity in Hard format ☐ Nrs. Language : ENGLISH ☐ Other Specify _____

Packing : Export ☐ Domestic ☐ Instructions required for packing :

Remark :

Name : Signature : Stamp or Seal

Designation : Date :

For CTR USE Quotation Nr. :

WORLDWIDE PRESENCE

CE 1282

CTR MANUFACTURING INDUSTRIES LTD

FIRE PROTECTION DIVISION
CTR MANUFACTURING INDUSTRIES LTD
NAGAR ROAD, PUNE 411014, INDIA.
T: 91-20 26633402/3/4/5. FAX: 91 20 26633425
exports@ctr.in / fireprotection@ctr.in
Website : www.ctr.in

PM FS.1005
JAN 2019