iST POWER

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INSTALLATION, COMMISSIONING, OPERATION & MAINTENANCE INSTRUCTIONS

BRUSH

CARDIFF EAST – 11kV EARTHING AUXILIARY TRANSFORMER

DETAILS

MANUAL NUMBER: **MM0708**
ISSUE 0

TRANSFORMER SPECIFICATION: **0105317**

PURCHASE ORDER NUMBER: **BT989205**

SERIAL NUMBERS: **101687**

REVISION RECORD

Revision	Change	Author	Date
0	First Issue	PWJ	09/06/2021

SECTION
1

DESCRIPTION

1.1 Introduction

The transformer manufactured by **iST POWER Ltd** is supplied as follows:

The neutral earthing transformer is a three phase, outdoor, oil cooled (Shell Diala S4 ZX-I) transformer for 11000V 50Hz 3 phase supply. The secondary output is a 3-Phase output at 415V.

1.2 Technical Description

Type	Oil Cooled (Shell Diala S4 ZX-I), double wound neutral earthing and auxiliary transformer in a KNAN, ground mounted tank.
Cooling	ONAN, Shell Diala S4 ZX-I Insulating Oil to IEC 60296
Rated Input Voltage	11000 V
Zero Sequence Impedance	18.15 Ω/Phase (-0% + 20%) (The measured value on test is stamped on the rating and diagram plate).
Fault Rating	1050 A for 30 seconds
Rated Continuous Current	278.3 A
Frequency	50Hz
Basic Insulation Level	28 kV RMS 95 kV Peak
Weight of Core & Coils	1060 kg
Liquid Quantity	855 Litres
Total Weight	3000 kg
Fittings	Name Rating and Diagram Plate Earthing Terminal Pressure Relief Device Re-connection Links Buchholz Relay Conservator Tank Lifting Lugs Oil Drain and Filter Valves Common Skid Base

Number of Phases	3 Phase + Neutral
Input Termination	3 x 12kV 1250A Euromold 400AR-4 Type-C Interface Separable connectors, mounted to accept cables fitted with Euromold elbow connectors from below. Located inside an bolted enclosed H.V. terminal box.
Neutral Termination	1 x 12kV 630A Webster-Wilkinson B9346-13M Oil/Air Bushing. Located in an air filled cable box.
Output Termination	3 Pole 400A Socomec Fuse Switch fitted with 315A Fuse Links. Located inside a L.V. cable box.
Neutral Current Transformers	Provisions made for C.T.'s to be fitted to the Neutral Termination cable box.
Vector Group	ZNyn1 or ZNyn11 by re-connection of off circuit L.V. links. Dispatched as Zyn11.

Specification IEC 60076

1.3 Detailed Description

The transformer consists of a three phase coil assembly each mounted on a core assembly.

The coils are wound from insulated copper strip conductor helically wound with ducts for cooling. The coils have been dried out prior to immersion in oil.

The stepped leg/stepped yoke cores are built up from laminations of cold rolled silicon steel. The laminations are interleaved with mitred corners and clamped with fabricated steel frames.

The transformer is contained within a fully welded steel tank with a bolted-on lid. The tank is complete with pressure relief device, drain & filter valves, conservator, Buchholz relay and self-dehydrating breather.

The input leads are made onto the H.V. bushings at the side of the tank inside the H.V. terminal box. Output leads are connected to the L.V. cable box located on the opposite side. It is connected via a 400A fuse switch.

The unit is filled with Shell Diala S4 ZX-I Insulating Oil. See Appendix A for details.

1.3.1 Transformer Tank and Termination Boxes

The transformer tank is of sheet steel welded construction.

The H.V. lines are located at the side of the tank inside the H.V. terminal box, behind a bolted access cover. The H.V. terminals are only suitable for connection with cables fitted with Euromold Type-C connectors.

The Neutral bushing is located in an air filled cable box next to the H.V. terminal box.

The L.V. connections are made at the L.V. cable box via a 400A fuse switch with 315A fuse links. See Appendix E for manufacturer details.

1.3.2 Auxiliary Equipment

The transformers are fitted with the following equipment: -

1) Buchholz Relay with alarm and trip contacts.

2) Pressure Relief Device with alarm/trip contacts mounted on the tank side with a duct to direct any expelled oil towards ground level.

3) A self de-hydrating breather is installed to the tank before transit. It will arrive attached to the transit fixing bracket. This must be changed so service position during assembly. See Appendix D for details.

Other fittings include removable cable gland plates, oil filter, drain valves and oil level sight glass.

SECTION 2

INSTALLATION INSTRUCTIONS

2.1 Introduction

These instructions are intended to give guidance and assistance in the installation and maintenance of the oil filled earthing transformer.

2.2 Method of Dispatch

Every precaution is taken to ensure that the equipment will arrive at its destination in perfect condition.

The units are despatched completely assembled, and tested on dedicated road transport.

2.3 Unpacking and Examination Upon Arrival

Immediately upon arrival the equipment should be thoroughly examined externally. Any damage should be reported at once to the Carrier and to **iST POWER Ltd** quoting the Advice Note details to enable a claim to be lodged with the responsible party. Any deficiencies of material should also be notified to the Carrier and to **iST POWER Ltd** immediately.

2.4 Handling

When lifting the equipment use the two lifting points, painted yellow, with the correct lifting slings through each lifting point. Great care must be taken not to knock or damage the equipment. Lifting weight of complete unit is 3000kg. Jacking lugs are provided on each side.

2.5 Storage

The unit is suitable for storing outdoors, if required, until commissioned.

2.6 Location

As this equipment is static, the location is of course fixed. Care must be taken to protect the unit from severe environments i.e. pollution from active chemicals, hot air blasting unit or any elements not deemed normal. The unit is despatched full of oil to operating level sealed for use outdoors with heavy duty paint finish.

2.7 Foundation and Connections

1) The equipment must be mounted on a fabricated plinth, securely fastened to a flat and level ground/deck.

2) Anti-vibration pads are provided to mount between the transformer base and the concrete plinth. The pads must be arranged as detailed on drawing 012019.

3) The L.V. connection leads to the output should be taken through cable entries provided by others and the connections fastened securely to the terminals of the Fuse Switch. The gland plate is non-magnetic stainless steel. Approved glands and cable terminations should be used. Ensure the internal earth connections to the gland plate and the box cover are made and secure.

4) The H.V. leads are connected to the terminals A4, B4, C4 & ZN. Refer to Section 6.1 for details.

5) Ensure that an efficient earth connection is made to the earth terminals on the tank. Each earth pad is coated with a rust proofing grease, 3M Molykote 111, to provide long term protection against corrosion. If this is removed or damaged during installation, then it should be recoated with the same or similar grease.

6) The transformer is fitted with re-connection links, to enable the vector group to be changed. On dispatch, the links are set for a vector group of ZNyn11. If required, the links under the main cover can be reconnected as shown on the label to change the vector group to ZNyn1. When changed, reverse the connection covering plate to show the ZNyn1 connection.

7) The transformer breather is a self de-hydrating unit fixed to the transformer in a transit position. During installation and assembly, the breather must be fitted into its service position. Refer to Appendix D for details.

SECTION
3

COMMISSIONING INSTRUCTIONS

3.1 General

Check the equipment for any obvious signs of damage, loose items and contamination by water or other substances. Check the oil level.

3.2 Equipment Pre-Commissioning Checks

The following electrical tests should be carried out on the equipment.

NOTE – Testing must be carried out by a suitably qualified and experienced test engineer.

NOTE – Under no circumstances must any H.V. testing be carried out on the transformer without the H.V. elbow connections being fitted.
Testing without these fittings may result in irreparable damage to the transformer bushings.

3.2.1 Ratio Measurement

Using a proprietary Transformer Ratiometer, check the transformer ratio. Compare the results with the values given in the test certificate.

3.2.2 Resistance Measurement

With the transformer isolated, measure the resistance of the windings. Compare with results in test certificate.

3.2.3 Insulation Resistance Measurement

With the transformer isolated the insulation resistance should be measured.

3.2.3.1 Measured with a 2500V Megger the following are minimum insulation resistance values.

a) Transformer Windings to Earth 200MΩ.
b) Primary Winding to Secondary Windings 500MΩ.

3.2.3.2 With a 500V Megger, check the L.V. wiring to earth. The minimum value of resistance should be 10MΩ.

3.2.3.3 Reconnect all leads.

3.3 Buchholz Relay

A Buchholz relay type BS50LA is fitted in the pipework between the conservator and the main tank. This gas detection device is fitted with normally open switches factory set.

See Appendix B for manufacturer details.

3.4 Pressure Relief Device

An auto re-setting pressure relief device is mounted on the main tank lid. It is set to release any pressure built up above 5.8PSI (0.4 atmospheres). A change-over contact indicates operation.

Operation of this device is usually an indication of major failure with the tank.

See Appendix C for manufacturer details.

3.5 De-Hydrating Breather

A self-dehydrating breather (Type SDB-14C) is fitted to the tank. Maintenance should be carried out as detailed in manufacturer's instructions.

Refer to Appendix D for details.

3.6 L.V. Fuse Switch

The L.V. Fuse Switch is a Socomec 400A Fuse Switch, fitted with 315A Fuse Links. The neutral is a separate bolted link.

Refer to Appendix E for manufacturer details.

3.7 Paintwork

The exterior paintwork should be inspected, and any damage caused through transport, installation or commissioning should be made good immediately.
The final colour is Dark Admiralty Grey to BS381C shade 632 gloss.

The general paint specification is detailed in specification 704-60170 in Appendix F.

SECTION 4

OPERATING INSTRUCTIONS

4.1 Unit Isolation

The transformer has no inherent means of input isolation. The supply to the transformer of 11kV 3 phase must therefore be isolated remotely and the terminals earthed.

ISOLATE ALL SUPPLIES PRIOR TO WORKING ON THIS EQUIPMENT.

SECTION 5

MAINTENANCE INSTRUCTIONS

MAINTENANCE MUST ONLY BE CARRIED OUT WHEN THE EQUIPMENT HAS BEEN TOTALLY ISOLATED.

5.1 Oil Sampling

The insulating liquid is Shell Diala S4 ZX-I Insulating Oil. See Appendix A for the safety data sheet. Oil samples should be taken via the sampling valve according to the attached schedule.

Following commissioning oil samples should be taken at the following intervals: -

a) after 6 months
b) after 12 months
c) after 60 months
d) thereafter every 5 years

The samples should have physical analysis, DGA, water content and breakdown strength measured and recorded for on-going monitoring. Any trend that indicates a deterioration of the transformer should be noted and the frequency of sampling increased as required.

After taking any oil sample check that the liquid level is correct via the liquid level gauge. Taking a liquid sample will remove 2.5 - 3 litres of oil.

Note – Replace or top up the transformer with Shell Diala S4 ZX-I Insulating Oil to IEC 60296

5.2 Buchholz Relay

The Buchholz relay type BS50LA is fitted with factory set alarm and trip relays (See Section 3.3). The contacts of the relay should be checked every 12 months for correct operation. See Appendix B for manufacturer data.

5.3 Pressure Relief Device

The rating of the micro switch is such that no maintenance of the contacts will be required during the life of the transformer. However, it is advisable that the contacts be checked every 12 months for correct switching by manual operation of the switch only. See Appendix C for manufacturer data.

5.4 L.V. Fuse Switch

The L.V. Fuse Switch requires no maintenance.

Refer to Appendix E for details.

5.5 General

The housing of the pressure relief device, L.V. switch and fuses and marshalling equipment should be checked for ingress of water or debris every 12 months and vacuumed/cleaned out as necessary.

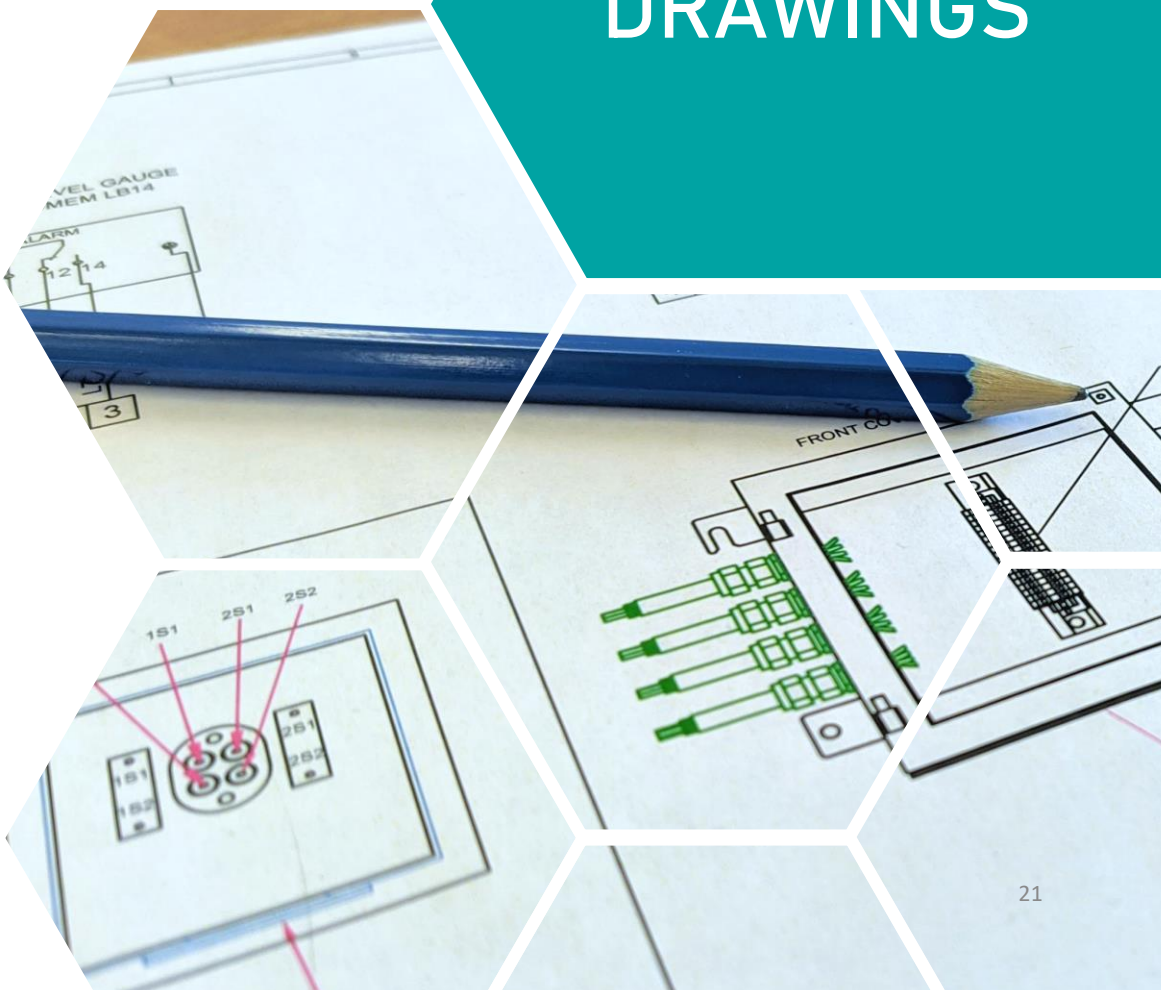
The paintwork should be touched up where required. Refer to paint specification 704-60170 in Appendix F.

The transformer liquid level should be checked in the sight glass. The level will be affected by the ambient temperature and the operating load on the transformer.

The whole transformer should be checked for oil leaks.

SECTION 6

DRAWINGS



6.1 List of Drawings

012004	Outline and General Arrangement
012027	Rating and Diagram Plate
012028	Auxiliary Wiring Diagram
012019	Anti-Vibration Pad Layout

IF IN DOUBT ASK

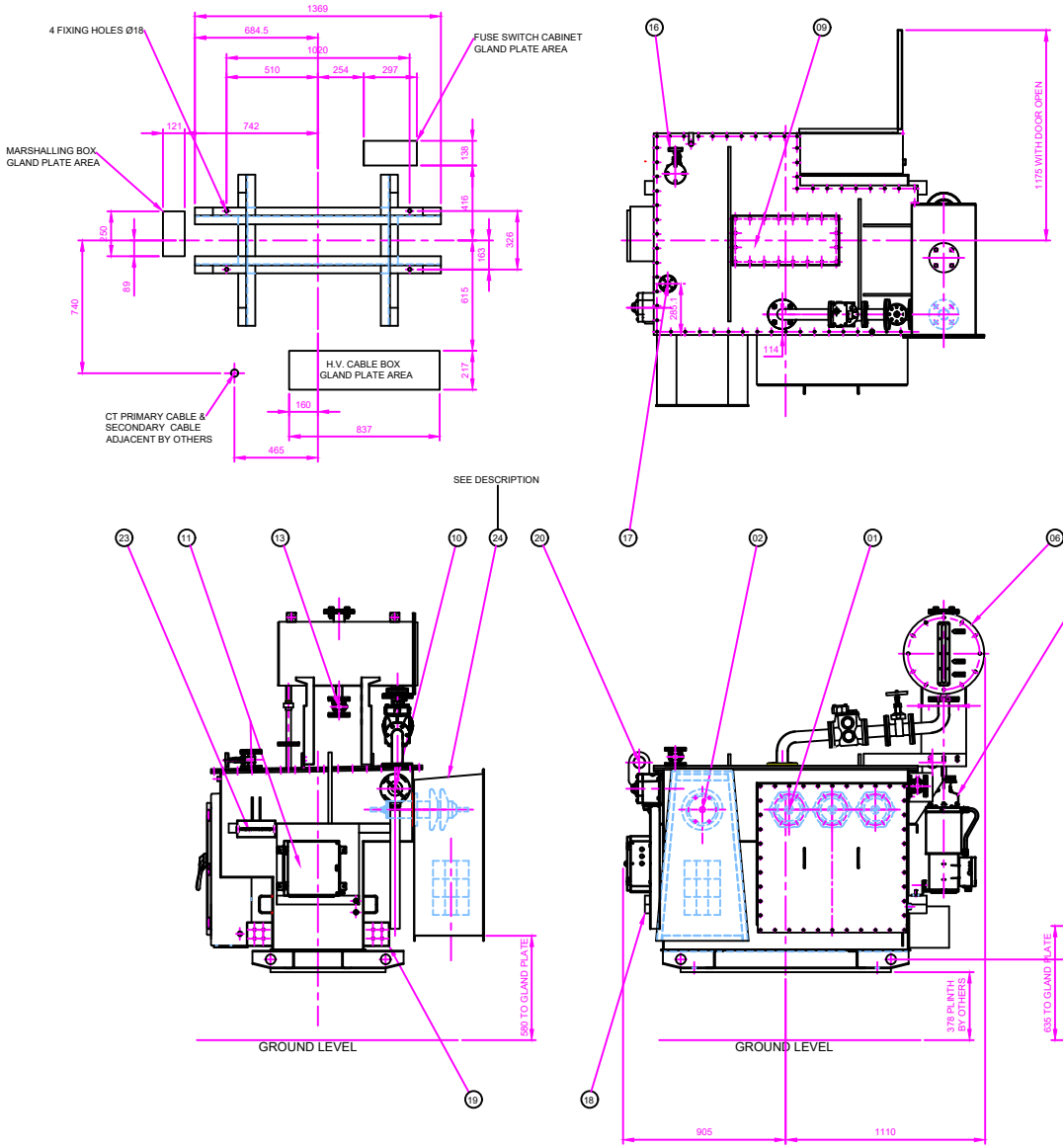
ESTIMATED WEIGHTS	kg
CORE & COILS & CT ASSY	1060
COMPLETE WITH 852 LITRES OF OIL	3000

kVA	200
VOLTS	11000/415
AMPS	10.5 / 278.3
VECTOR SYMBOL	ZNyn1 / ZNyn11

IMPEDANCE (Z+ve) 4.75% max
18.15 Ohms/Phase -0 +20%

FINAL COLOUR : DARK ADMIRALTY GREY TO BS381C SHADE 632
NOTE : LIFTERS AND JACKING POINTS PAINTED YELLOW

REFS	DESCRIPTION
01	HV TERMINALS 12kV, 1250A, TYPE 'C' - 400AR-4
02	NEUTRAL BUSHING - 12kV 630AMPS P12
03	FUSE SWITCH CABINET C/W 400A, 3P + BOLTED NEUTRAL FUSE SWITCH C/W 315 AMP FUSE LINKS
04	CONSERVATOR
05	BLANKING PLATE - OIL FILLING FLANGE - DN50
06	REMOVABLE CONSERVATOR END COVERS - C/W PRISMATIC OIL GAUGE
07	BUCHHOLZ RELAY - DN50
08	CONSERVATOR ISOLATING VALVE - DN50
09	ACCESS COVER TO VECTOR LINK BOARD
10	P.R.D WITH OIL DIRECTION DUCT
11	MARSHALLING BOX
12	BOTTOM DRAIN & OIL SAMPLING VALVE - DN25
13	CONSERVATOR DRAIN VALVE - DN25
14	BREATHER - LOW MAINTENANCE TYPE COMEM SDB-14C
15	LABEL - RATING AND DIAGRAM PLATE
16	TOP FILTER VALVE - DN25
17	THERMOMETER WELL
18	JACKING POINTS - PAINTED YELLOW
19	EARTH PADS - 2 WITH 4 - 15 DIA HOLES
20	MAIN LIFTERS - 60 DIA HOLE - PAINTED YELLOW
21	SKID UNDERBASE WITH 54DIA HAULAGE HOLES
22	1.0kV CORE EARTH BUSHING WITH GUARD
23	PETCOCK VALVE ENCLOSURE
24	NEUTRAL BUSHING & CT ENCLOSURE IN ACCORDANCE WITH WESTERN POWER DRAWING SSD0188. ENCLOSURE DOES NOT HAVE PROVISION FOR MOUNTING CT ASSEMBLY WITHIN



PLINTH SUPPLIED BY OTHERS

WHERE USED 0105317	TOLERANCES UNLESS OTHERWISE STATED : NO DECIMAL PLACE ±1mm ONE DECIMAL PLACE ±0.4mm ANGULAR ±1°	A1	594 X 841

ISSUE	BY	ECN	DESCRIPTION	DATE
0			NEW	
1	I.W.	M1524	SEE ECN	30/03/20

TITLE

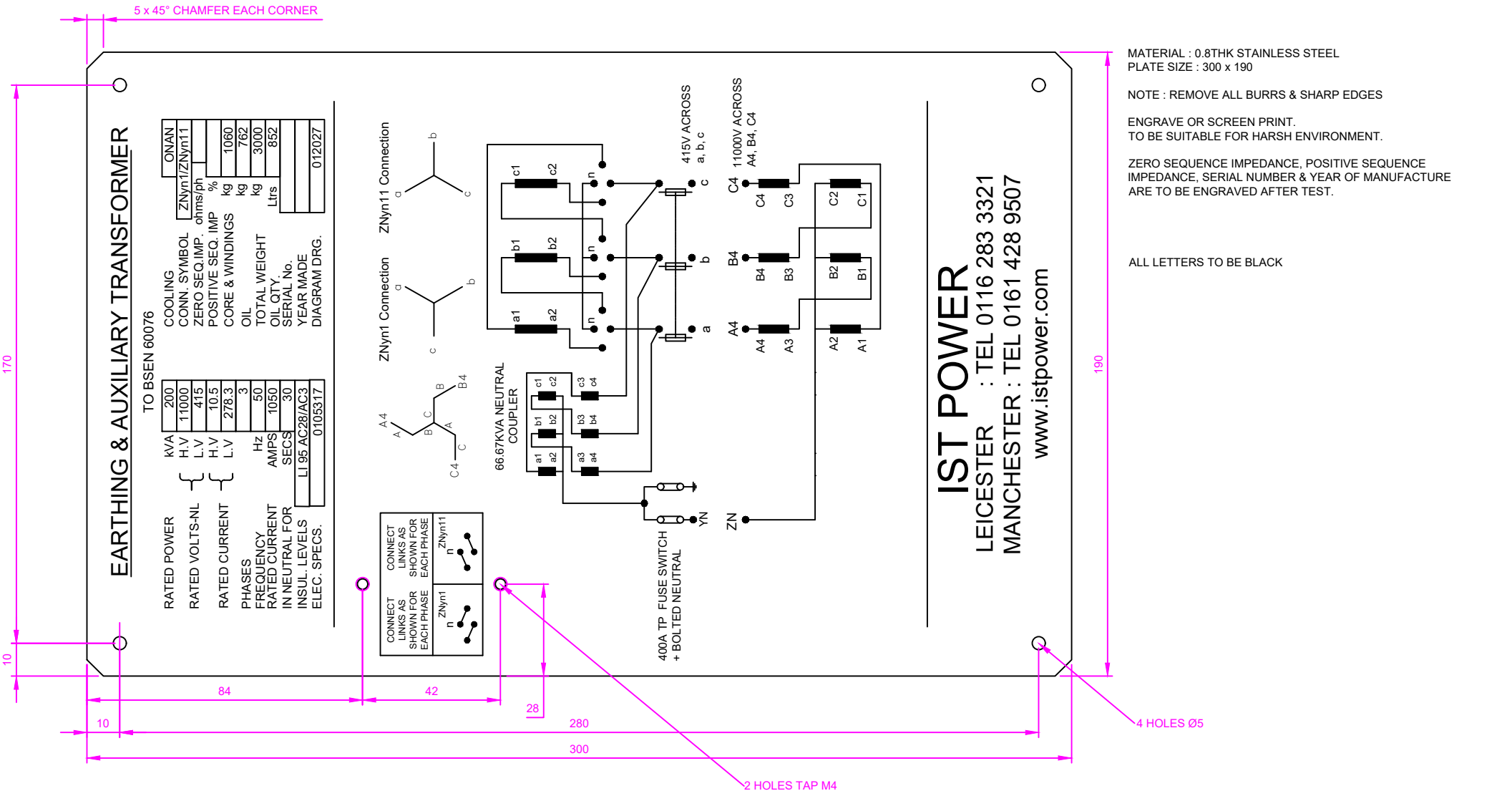
OUTLINE 200kVA,
11kV, 415V, 1050A for 30secs
EAT with NEUTRAL COUPLER

iST POWER
IST Power Ltd.
LEICESTER : 0116 2833321
MANCHESTER : 0161 428 9507

DRAWN	CHECKED	SCALE	DATE
I. WILSON	M.K.	1:15	20/01/2020

DRAWING No. 012004 SHEET No. 1

IF IN DOUBT ASK



MATERIAL : 0.8THK STAINLESS STEEL
PLATE SIZE : 300 x 190

NOTE : REMOVE ALL BURRS & SHARP EDGES

ENGRAVE OR SCREEN PRINT.
TO BE SUITABLE FOR HARSH ENVIRONMENT.

ZERO SEQUENCE IMPEDANCE, POSITIVE SEQUENCE IMPEDANCE, SERIAL NUMBER & YEAR OF MANUFACTURE ARE TO BE ENGRAVED AFTER TEST.

ALL LETTERS TO BE BLACK

WHERE USED 0105317

TOLERANCES UNLESS OTHERWISE STATED : NO DECIMAL PLACE ±1mm ONE DECIMAL PLACE ±0.4mm ANGULAR ±1°

A3 297 X 420

ISSUE	BY	ECN	DESCRIPTION	DATE
0			NEW	

TITLE

RATING & DIAGRAM PLATE

11kV 415V 1050A for 30 seccs

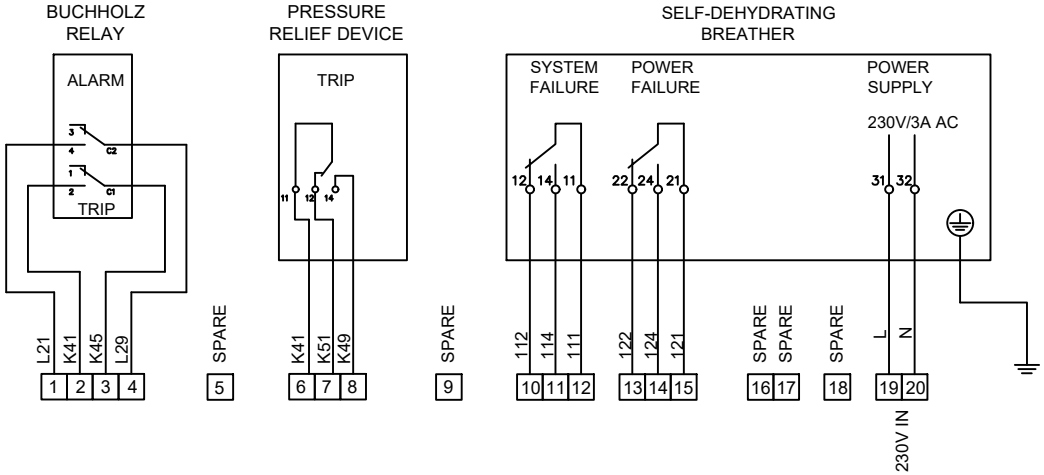
iST POWER
IST Power Ltd.
LEICESTER : 0116 2833321
MANCHESTER : 0161 428 9507

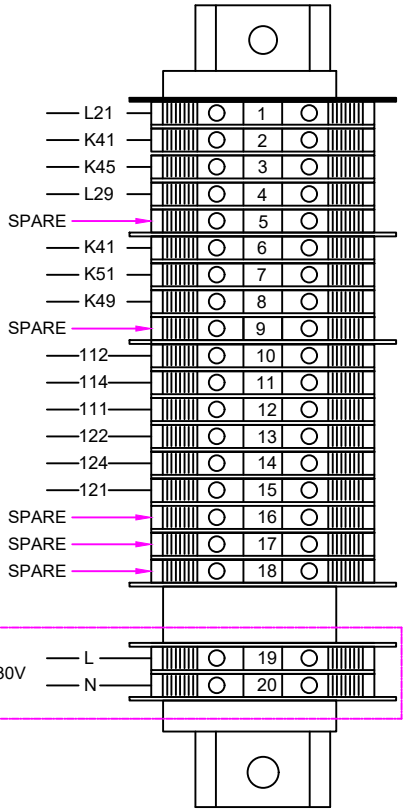
DRAWN	CHECKED	SCALE	DATE
PWJ	MK	1:1.2	26/03/20

DRAWING No. 012027

SHEET No. 1

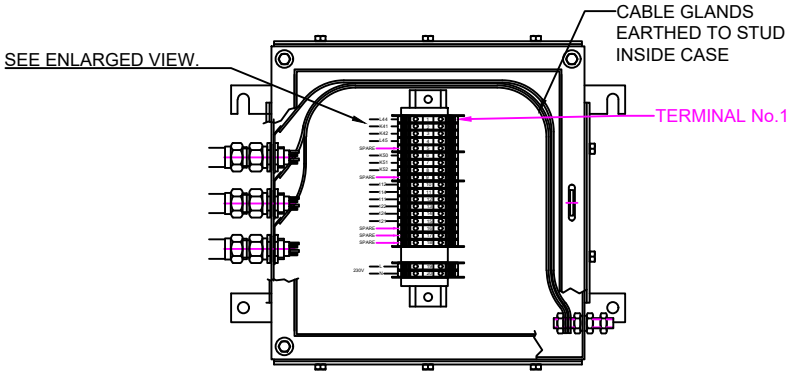
IF IN DOUBT ASK





INSTRUMENT	CONTACTS	OPERATION	COMMENTS
BUCHHOLZ RELAY	1 N.O ALARM	CLOSES ON EXCESS GAS	ALARM
	1 N.O TRIP	CLOSES ON OIL SURGE	TRIP
PRESSURE RELIEF DEVICE PRD	1 N.O 1 N.C	CHANGE OVER ON RELEASE	RELEASE AT 5.8 P.S.I.
DEHYDRATING BREATHER	1 N.C. ALARM (CONTACTS 11-12)	CONTACT MADE IN ALARM CONDITION	SYSTEM FAILURE
	1 N.C. ALARM (CONTACTS 21-22)	CONTACT MADE IN ALARM CONDITION	POWER FAILURE

CONTROL WIRING - 2.5mm² P.V.C SWA CABLE



TERMINAL BLOCKS TO BE SPRING LOADED TYPE. WITH HOOK TYPE CABLE TERMINATION.
TERMINAL BLOCKS TO BE NUMBERED
SEE ENLARGED VIEW

WHERE USED 0105317

TOLERANCES UNLESS OTHERWISE STATED : NO DECIMAL PLACE ±1mm ONE DECIMAL PLACE ±0.4mm ANGULAR ±1°

A3 297 X 420

ISSUE	BY	ECN	DESCRIPTION	DATE
0			NEW	

TITLE

AUXILIARY WIRING DIAGRAM
200kVA 11000/415V

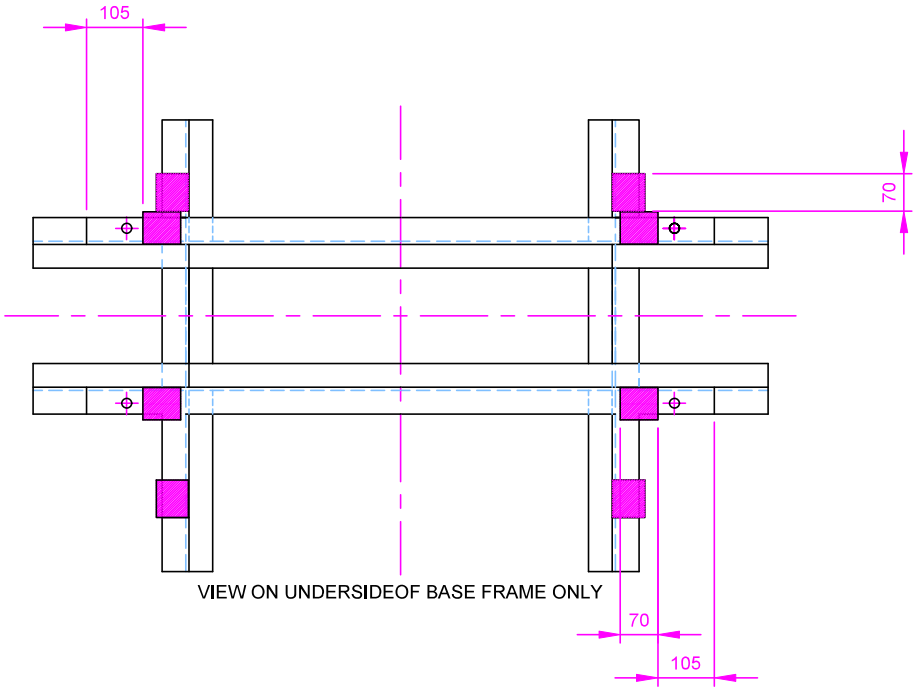
iST POWER
IST Power Ltd.
LEICESTER : 0116 2833321
MANCHESTER : 0161 428 9507

DRAWN	CHECKED	SCALE	DATE
PWJ	MK	NTS	26/03/2020

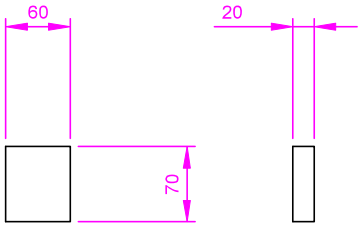
DRAWING No. 012028

SHEET No. 1 OF 1

IF IN DOUBT ASK



VIEW ON UNDERSIDEOF BASE FRAME ONLY



PAD DETAIL

MATERIAL VC6400 20mm THICK

SAB ON ONE SIDE OF PAD

QTY - 8

PADS SHOWN IN POSITION ON BASEFRAME

WHERE USED 0105317

TOLERANCES UNLESS OTHERWISE STATED : NO DECIMAL PLACE ±1mm ONE DECIMAL PLACE ±0.4mm ANGULAR ±1°

A3 297 X 420

ISSUE	BY	ECN	DESCRIPTION	DATE
0			NEW	
1	I.W.	M1525	SEE ECN	31/03/20

TITLE

AV PADS LOCATION & DETAIL

iST POWER
IST Power Ltd.
LEICESTER : 0116 2833321
MANCHESTER : 0161 428 9507

DRAWN	CHECKED	SCALE	DATE
I.WILSON	M.K.	1:10	17/03/2020

DRAWING No. 012019

SHEET No. 1

SECTION
7

APPENDIX A

COOLING LIQUID:
SHELL DIALA S4 ZX-I

(DATA SHEET - 2 PAGES)
(SAFETY DATA SHEET – 20 PAGES)

Technical Data Sheet

Shell Diala *S4 ZX-I*

- *Extra Performance*
- *Meets IEC 60296 - Higher Oxidation Stability & Low Sulphur content*

Premium Inhibited Electrical Insulating Oil

Shell Diala S4 ZX-I is the new electrical insulating oil from Shell designed to meet the challenges presented by the latest power transformers. It offers an extended oil life with the peace of mind of zero sulphur content.
Shell Diala S4 ZX-I is manufactured from zero sulphur base oils produced using Shell's GTL (gas-to-liquid) technology. These base oils offer a high degree of compositional consistency and have an excellent response to anti-oxidant. In addition they are globally available and free from PCBs, DBDS and passivators.
Shell Diala S4 ZX-I meets both the established and new industry copper corrosion tests.

DESIGNED TO MEET CHALLENGES

Performance, Features & Benefits

- **Extended oil life**
  Shell Diala S4 ZX-I is a fully inhibited oil giving outstanding oxidation performance and an extended oil life. Shell Diala S4 ZX-I is also suitable for use in highly loaded applications.
- **Transformer protection**
  Shell Diala S4 ZX-I is manufactured from a zero sulphur* base oil, making it intrinsically non-corrosive towards copper, without the need for passivation or other additives.
  Shell Diala S4 ZX-I meets all relevant tests for copper corrosion, namely the established DIN 51353 (Silver Strip Test), ASTM D1275, and also the latest more severe tests: IEC 62535 and ASTM D1275B.
  *Sulphur content below 1ppm detection limit of ASTM D5185
- **System efficiency**
  The good low temperature viscometric properties of the oil ensure proper heat transfer inside the transformer, even from very low starting temperatures.

Shell Diala S4 ZX-I is specially dried and handled to achieve a low water content and retain a high breakdown voltage at point of delivery. This enables it to be used in many applications without further treatment.

Main Applications


Specifications, Approvals & Recommendations

- IEC 60296 (2012): Table 2 Transformer Oil (I) (Inhibited Oil) Section 7.1 ("Higher oxidation stability and low sulphur content").
  For a full listing of equipment approvals and recommendations, please consult your local Shell Technical Help Desk, or the OEM Approvals website.

Typical physical characteristics

Properties			Method	IEC 60296 Table 2 + section 7.1	Shell Diala S4 ZX-I Typical
Appearance			IEC 60296	Clear, free from sediment and suspended matter	Complies
Density	@20°C	kg/m³	ISO 3675	Max. 895	805
Kinematic Viscosity	@40°C	mm²/s	ISO 3104	Max. 12	9.6
Kinematic Viscosity	@-30°C	mm²/s	ISO 3104	Max. 1 800	382
Flashpoint P.M.		°C	ISO 2719	Min. 135	191
Pour Point		°C	ISO 3016	Max. -40	-42
Neutralisation value	mg KOH/g		IEC 62021-1	Max. 0.01	<0.01
Total Sulphur Content	mg/kg		ASTM D5185	Max. 500	<1
Corrosive Sulphur			DIN 51353	Not corrosive	Not corrosive

Properties			Method	IEC 60296 Table 2 + section 7.1	Shell Diala S4 ZX-I Typical
Potentially Corrosive Sulphur			IEC 62535	Not corrosive	Not corrosive
Corrosive Sulphur			ASTM D1275 B		Not corrosive
Breakdown Voltage Untreated	kV		IEC 60156	Min. 30	60
Breakdown Voltage After Treatment	kV		IEC 60156	Min. 70	75
Dielectric Dissipation Factor	@90°C	DDF	IEC 60247	Max 0.005	<0.001
Oxidation Stability	500h / 120°C		IEC 61125 C	Section 7.1 Limits	
Total Acidity	mg KOH/g		IEC 61125 C	Max 0.3	0.02
Sludge		%m	IEC 61125 C	Max 0.05	<0.01
Dielectric Dissipation Factor (DDF @90°C)			IEC 61125 C	Max 0.05	0.001
Water content (drums and IBC)	mg/kg		IEC 60814	Max 40	6
Water content (Bulk)	mg/kg		IEC 60814	Max 30	6
2-Furfural and related compounds content	mg/kg		IEC 61198	Not detectable	Complies
Metal passivator additives	mg/kg		IEC 60666	Not detectable	Complies
Oxidation inhibitor content (DBPC)		% mass			0.2
PCA Content		% mass	IP346	Max 3	Complies
PCB content	mg/kg		IEC 61619	Not detectable	Complies

These characteristics are typical of current production. Whilst future production will conform to Shell's specification, variations in these characteristics may occur.

Health, Safety & Environment

- **Health and Safety**

  Shell Diala S4 ZX-I is unlikely to present any significant health or safety hazard when properly used in the recommended application and good standards of personal hygiene are maintained.

  Shell Diala S4 ZX-I is free from polychlorinated biphenyls (PCB).

  Avoid contact with skin. Use impervious gloves with used oil. After skin contact, wash immediately with soap and water.

  Guidance on Health and Safety is available on the appropriate Material Safety Data Sheet, which can be obtained from your Shell representative.

- **Protect the Environment**

  Take used oil to an authorised collection point. Do not discharge into drains, soil or water.

Additional Information

Storage precautions

The critical electrical properties of Shell Diala are easily compromised by trace contamination with foreign material. Typically encountered contaminants include moisture, particles, fibres and surfactants. Therefore, it is imperative that electrical insulating oils be kept clean and dry.

It is strongly recommended that storage containers be dedicated for electrical service and include air-tight seals. It is further recommended that electrical insulating oils are stored indoors in climate-controlled environments.

Advice

Advice on applications not covered here may be obtained from your shell representative.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name	:	Diala S4 ZX-I
Product code	:	001E8701
UFI	:	P8R0-G0R2-U00Y-A3J1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use of the Substance/Mixture	:	Insulating oil.
Uses advised against	:	This product must not be used in applications other than those listed in Section 1 without first seeking the advice of the supplier.

1.3 Details of the supplier of the safety data sheet

Manufacturer/Supplier	:	**Shell UK Oil Products Limited** Shell Centre London SE1 7NA United Kingdom
Telephone	:	(+44) 08007318888
Telefax	:	
Email Contact for Safety Data Sheet	:	If you have any enquiries about the content of this SDS please email lubricantSDS@shell.com

1.4 Emergency telephone number

: +44 (0) 151 350 4595 (This telephone number is available 24 hours per day, 7 days per week)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Aspiration hazard, Category 1	H304: May be fatal if swallowed and enters airways.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Signal word : Danger

Hazard statements :

PHYSICAL HAZARDS:
Not classified as a physical hazard according to CLP criteria.
HEALTH HAZARDS:
H304 May be fatal if swallowed and enters airways.
ENVIRONMENTAL HAZARDS:
Not classified as environmental hazard according to CLP criteria.

Precautionary statements :

Prevention:
No precautionary phrases.
Response:
P331 Do NOT induce vomiting.
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
Storage:
P405 Store locked up.
Disposal:
P501 Dispose of contents/ container to an approved waste disposal plant.

Hazardous components which must be listed on the label:
Contains Distillates (Fischer - Tropsch), heavy, C18-50 - branched, cyclic and linear.

2.3 Other hazards

This mixture does not contain any REACH registered substances that are assessed to be a PBT or a vPvB.
Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis.
Used oil may contain harmful impurities.
Not classified as flammable but will burn.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Chemical nature : Fischer-Tropsch derived hydrocarbon base oil.

Hazardous components

Chemical name	CAS-No. EC-No. Registration	Classification (REGULATION (EC) No	Concentration (% w/w)

	number	1272/2008)	
Distillates (Fischer - Tropsch), heavy, C18-50 – branched, cyclic and linear	848301-69-9 482-220-0 01-0000020163-82	Asp. Tox.1; H304	95 - 100
Butylated hydroxytoluene	128-37-0 204-881-4 01-2119565113-46	Aquatic Chronic1; H410 Aquatic Acute1; H400	0.1 - 0.24

For explanation of abbreviations see section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

Protection of first-aiders : When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.

If inhaled : No treatment necessary under normal conditions of use.
If symptoms persist, obtain medical advice.

In case of skin contact : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available.
If persistent irritation occurs, obtain medical attention.

In case of eye contact : Flush eye with copious quantities of water.
Remove contact lenses, if present and easy to do. Continue rinsing.
If persistent irritation occurs, obtain medical attention.

If swallowed : Call emergency number for your location / facility.
If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration.
If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms : If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever.
The onset of respiratory symptoms may be delayed for several hours after exposure.
Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance.
Ingestion may result in nausea, vomiting and/or diarrhoea.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment	:	Potential for chemical pneumonitis. Call a doctor or poison control center for guidance.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable extinguishing media	:	Do not use water in a jet.

5.2 Special hazards arising from the substance or mixture

Specific hazards during firefighting	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Unidentified organic and inorganic compounds.

5.3 Advice for firefighters

Special protective equipment for firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions	:	6.1.1 For non emergency personnel: Avoid contact with skin and eyes. 6.1.2 For emergency responders: Avoid contact with skin and eyes.

6.2 Environmental precautions

Environmental precautions	:	Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers.

6.3 Methods and materials for containment and cleaning up

Methods for cleaning up : Slippery when spilt. Avoid accidents, clean up immediately.
Prevent from spreading by making a barrier with sand, earth or other containment material.
Reclaim liquid directly or in an absorbent.
Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly.

6.4 Reference to other sections

For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet., For guidance on disposal of spilled material see Section 13 of this Safety Data Sheet.

SECTION 7: Handling and storage

General Precautions : Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.
Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.

7.1 Precautions for safe handling

Advice on safe handling : Avoid prolonged or repeated contact with skin.
Avoid inhaling vapour and/or mists.
When handling product in drums, safety footwear should be worn and proper handling equipment should be used.
Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.

Product Transfer : Proper grounding and bonding procedures should be used during all bulk transfer operations to avoid static accumulation.

7.2 Conditions for safe storage, including any incompatibilities

Other data : Keep container tightly closed and in a cool, well-ventilated place. Use properly labeled and closable containers.

Store at ambient temperature.

Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

The storage of this product may be subject to the Control of Pollution (Oil Storage) (England) Regulations. Further guidance may be obtained from the local environmental agency office.

Packaging material : Suitable material: For containers or container linings, use mild steel or high density polyethylene.
Unsuitable material: PVC.

Container Advice : Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.

7.3 Specific end use(s)

Specific use(s) : Not applicable.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure Limits

Components	CAS-No.	Value type (Form of exposure)	Control parameters	Basis
Oil mist, mineral		TWA	5 mg/m3	US. ACGIH Threshold Limit Values

Biological occupational exposure limits

No biological limit allocated.
Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.
Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.

National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/

Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/

Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances http://www.hse.gov.uk/

Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany http://www.dguv.de/inhalt/index.jsp

L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/accueil

8.2 Exposure controls

Engineering measures The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include:

Adequate ventilation to control airborne concentrations.

Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.

General Information:
Define procedures for safe handling and maintenance of controls.
Educate and train workers in the hazards and control measures relevant to normal activities associated with this product.
Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation.
Drain down system prior to equipment break-in or maintenance.
Retain drain downs in sealed storage pending disposal or subsequent recycle.
Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned.
Practice good housekeeping.
Do not ingest. If swallowed, then seek immediate medical assistance

Personal protective equipment

The provided information is made in consideration of the PPE directive (Council Directive 89/686/EEC) and the CEN European Committee for Standardisation (CEN) standards.

Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Eye protection	:	If material is handled such that it could be splashed into eyes, protective eyewear is recommended. Approved to EU Standard EN166.
Hand protection		
Remarks	:	Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. PVC, neoprene or nitrile rubber gloves Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough

time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model.

Skin and body protection : Skin protection is not ordinarily required beyond standard work clothes.
It is good practice to wear chemical resistant gloves.

Respiratory protection : No respiratory protection is ordinarily required under normal conditions of use.
In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material.
If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation.
Check with respiratory protective equipment suppliers.
Where air-filtering respirators are suitable, select an appropriate combination of mask and filter.
Select a filter suitable for combined particulate/organic gases and vapours [Type A/Type P boiling point > 65°C (149°F)] meeting EN14387 and EN143.

Thermal hazards : Not applicable

Hygiene measures : Exposure to this product should be reduced as low as reasonably practicable. Reference should be made to the Health and Safety Executive's publication "COSHH Essentials".

Environmental exposure controls

General advice : Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.
Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.
Information on accidental release measures are to be found in section 6.
Take appropriate measures to fulfil the requirements of relevant environmental protection legislation. Avoid contamination of the environment by following advice given in Section 6. If necessary, prevent undissolved material from being discharged to waste water. Waste water should be treated in a municipal or industrial waste water treatment plant

before discharge to surface water.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	:	Liquid at room temperature.
Colour	:	colourless
Odour Threshold	:	Data not available
pH	:	Not applicable
pour point	:	<= -40 °CMethod: ISO 3016
Melting / freezing point		Data not available
Initial boiling point and boiling range	:	> 280 °Cestimated value(s)
Flash point	:	191 °C Method: ISO 2719
Evaporation rate	:	Data not available
Flammability (solid, gas)	:	Data not available
Upper explosion limit	:	Typical 10 %(V)
Lower explosion limit	:	Typical 1 %(V)
Vapour pressure	:	< 0.5 Pa (20 °C) estimated value(s)
Relative vapour density	:	> 1estimated value(s)
Relative density	:	0.805 (20 °C)
Density	:	805 kg/m3 (20 °C) Method: ISO 3675
Solubility(ies)		
Water solubility	:	negligible
Solubility in other solvents	:	Data not available
Partition coefficient: n-octanol/water	:	log Pow: > 6(based on information on similar products)
Auto-ignition temperature	:	> 320 °C

Decomposition temperature	:	Data not available
Viscosity		
Viscosity, dynamic	:	Data not available
Viscosity, kinematic	:	<= 12.00 mm2/s (40.0 °C) Method: ISO 3104
Explosive properties	:	Not classified
Oxidizing properties	:	Data not available

9.2 Other information

Conductivity	:	This material is not expected to be a static accumulator.

SECTION 10: Stability and reactivity

10.1 Reactivity

The product does not pose any further reactivity hazards in addition to those listed in the following sub-paragraph.

10.2 Chemical stability

Stable.
No hazardous reaction is expected when handled and stored according to provisions

10.3 Possibility of hazardous reactions

Hazardous reactions	:	Reacts with strong oxidising agents.

10.4 Conditions to avoid

Conditions to avoid	:	Extremes of temperature and direct sunlight.

10.5 Incompatible materials

Materials to avoid	:	Strong oxidising agents.

10.6 Hazardous decomposition products

Hazardous decomposition products	:	No decomposition if stored and applied as directed.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Basis for assessment	:	Information given is based on data on the components and the toxicology of similar products.Unless indicated otherwise,

the data presented is representative of the product as a whole, rather than for individual component(s).

Information on likely routes of exposure : Skin and eye contact are the primary routes of exposure although exposure may occur following accidental ingestion.

Acute toxicity

Product:

Acute oral toxicity : LD50 rat: > 5,000 mg/kg
Remarks: Low toxicity:
Based on available data, the classification criteria are not met.

Remarks: Aspiration into the lungs may cause chemical pneumonitis which can be fatal.

Acute inhalation toxicity : Remarks: Based on available data, the classification criteria are not met.

Acute dermal toxicity : LD50 Rabbit: > 5,000 mg/kg
Remarks: Low toxicity:
Based on available data, the classification criteria are not met.

Skin corrosion/irritation

Product:

Remarks: Slightly irritating to skin., Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis., Based on available data, the classification criteria are not met.

Serious eye damage/eye irritation

Product:

Remarks: Slightly irritating to the eye., Based on available data, the classification criteria are not met.

Respiratory or skin sensitisation

Product:

Remarks: For respiratory and skin sensitisation:, Not a sensitiser., Based on available data, the classification criteria are not met.

Germ cell mutagenicity

Product:

: Remarks: Non mutagenic, Based on available data, the

classification criteria are not met.

Carcinogenicity

Product:

Remarks: Not a carcinogen., Based on available data, the classification criteria are not met.

Remarks: Product contains mineral oils of types shown to be non-carcinogenic in animal skin-painting studies., Highly refined mineral oils are not classified as carcinogenic by the International Agency for Research on Cancer (IARC).

Material	GHS/CLP Carcinogenicity Classification
Distillates (Fischer - Tropsch), heavy, C18-50 – branched, cyclic and linear	No carcinogenicity classification.
Butylated hydroxytoluene	No carcinogenicity classification.

Material	Other Carcinogenicity Classification
Butylated hydroxytoluene	IARC: Group 3: Not classifiable as to its carcinogenicity to humans

Reproductive toxicity

Product:

:

Remarks: Not a developmental toxicant., Does not impair fertility., Based on available data, the classification criteria are not met.

STOT - single exposure

Product:

Remarks: Based on available data, the classification criteria are not met.

STOT - repeated exposure

Product:

Remarks: Based on available data, the classification criteria are not met.

Aspiration toxicity

Product:

Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.

Further information

Product:

Remarks: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal., ALL used oil should be handled with caution and skin contact avoided as far as possible.

Remarks: Slightly irritating to respiratory system.

Remarks: Classifications by other authorities under varying regulatory frameworks may exist.

Summary on evaluation of the CMR properties

Germ cell mutagenicity-Assessment	:	This product does not meet the criteria for classification in categories 1A/1B.
Carcinogenicity - Assessment	:	This product does not meet the criteria for classification in categories 1A/1B.
Reproductive toxicity - Assessment	:	This product does not meet the criteria for classification in categories 1A/1B.

SECTION 12: Ecological information

12.1 Toxicity

Basis for assessment	:	Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).(LL/EL/IL50 expressed as the nominal amount of product required to prepare aqueous test extract).

Product:

Toxicity to fish (Acute toxicity)	:	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.

Toxicity to crustacean (Acute toxicity)	:	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to algae/aquatic plants (Acute toxicity)	:	Remarks: LL/EL/IL50 > 100 mg/l Practically non toxic: Based on available data, the classification criteria are not met.
Toxicity to fish (Chronic toxicity)	:	Remarks: Based on available data, the classification criteria are not met.
Toxicity to crustacean (Chronic toxicity)	:	Remarks: Based on available data, the classification criteria are not met.
Toxicity to microorganisms (Acute toxicity)	:	Remarks: Based on available data, the classification criteria are not met.

Components:
Butylated hydroxytoluene :

M-Factor (Short-term (acute) aquatic hazard)	:	1
M-Factor (Long-term (chronic) aquatic hazard)	:	1

12.2 Persistence and degradability

Product:

Biodegradability	:	Remarks: Not readily biodegradable., Major constituents are inherently biodegradable, but contains components that may persist in the environment.

12.3 Bioaccumulative potential

Product:

Bioaccumulation	:	Remarks: Contains components with the potential to bioaccumulate.
Partition coefficient: n-octanol/water	:	log Pow: > 6Remarks: (based on information on similar products)

12.4 Mobility in soil

Product:

Mobility	:	Remarks: Liquid under most environmental conditions., If it enters soil, it will adsorb to soil particles and will not be mobile. Remarks: Floats on water.

12.5 Results of PBT and vPvB assessment

Product:

Assessment : This mixture does not contain any REACH registered substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

Product:

Additional ecological information : Does not have ozone depletion potential, photochemical ozone creation potential or global warming potential., Product is a mixture of non-volatile components, which will not be released to air in any significant quantities under normal conditions of use.
Poorly soluble mixture., Causes physical fouling of aquatic organisms.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.
Do not dispose into the environment, in drains or in water courses

Waste product should not be allowed to contaminate soil or ground water, or be disposed of into the environment.
Waste, spills or used product is dangerous waste.
Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination.

MARPOL - see International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) which provides technical aspects at controlling pollutions from ships.

Contaminated packaging : Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand. Disposal should be in accordance with applicable regional, national, and local laws and regulations.

Local legislation

Waste catalogue	:	
		EU Waste Disposal Code (EWC):
Waste Code	:	
		13 03 07*
Remarks	:	Disposal should be in accordance with applicable regional, national, and local laws and regulations. Classification of waste is always the responsibility of the end user. Hazardous Waste (England and Wales) Regulations 2005.

SECTION 14: Transport information

14.1 UN number

ADR	:	Not regulated as a dangerous good
RID	:	Not regulated as a dangerous good
IMDG	:	Not regulated as a dangerous good
IATA	:	Not regulated as a dangerous good

14.2 Proper shipping name

ADR	:	Not regulated as a dangerous good
RID	:	Not regulated as a dangerous good
IMDG	:	Not regulated as a dangerous good
IATA	:	Not regulated as a dangerous good

14.3 Transport hazard class

ADR	:	Not regulated as a dangerous good
RID	:	Not regulated as a dangerous good
IMDG	:	Not regulated as a dangerous good
IATA	:	Not regulated as a dangerous good

14.4 Packing group

ADR	:	Not regulated as a dangerous good
RID	:	Not regulated as a dangerous good
IMDG	:	Not regulated as a dangerous good
IATA	:	Not regulated as a dangerous good

14.5 Environmental hazards

ADR	:	Not regulated as a dangerous good
RID	:	Not regulated as a dangerous good
IMDG	:	Not regulated as a dangerous good

14.6 Special precautions for user

Remarks : Special Precautions: Refer to Section 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied. MARPOL Annex 1 rules apply for bulk shipments by sea.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

REACH - List of substances subject to authorisation (Annex XIV) : Product is not subject to Authorisation under REACH.

Volatile organic compounds : 0 %

Other regulations : The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Environmental Protection Act 1990 (as amended). Health and Safety at Work etc. Act 1974. Consumers Protection Act 1987. Pollution Prevention and Control Act 1999. Environment Act 1995. Factories Act 1961. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment (Amendment) Regulations 2011. Chemicals (Hazard Information and Packaging for Supply) Regulations 2009. Control of Substances Hazardous to Health Regulations 2002 (as amended). Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997. Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (as amended). Personal Protective Equipment Regulations 2002. Personal Protective Equipment at Work Regulations 1992. Hazardous Waste (England and Wales) Regulations 2005(as amended). Control of Major Accident Hazards Regulations 1999 (as amended). Renewable Transport Fuel Obligations Order 2007 (as amended). Energy Act 2011. Environmental Permitting (England and Wales) Regulations 2010 (as amended). Waste (England and Wales) Regulations 2011 (as amended). Planning (Hazardous Substances) Act 1990 and associated regulations. The Environmental Protection (Controls on Ozone-Depleting Substances) Regulations 2011.

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), annex XIV.
Regulation (EC) No 1907/2006 of the European Parliament

and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), annex XVII.
Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work and its amendments.
Directive 1994/33/EC on the protection of young people at work and its amendments.
Council Directive 92/85/EEC on the introduction of measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding and its amendments.

The components of this product are reported in the following inventories:

EINECS	:	Not established.
TSCA	:	All components listed.

15.2 Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

SECTION 16: Other information

REGULATION (EC) No 1272/2008	**Classification procedure:**
Aspiration hazard, Category 1, H304	Expert judgement and weight of evidence determination.

Full text of H-Statements

H304	May be fatal if swallowed and enters airways.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of other abbreviations

Aquatic Acute	Short-term (acute) aquatic hazard
Aquatic Chronic	Long-term (chronic) aquatic hazard
Asp. Tox.	Aspiration hazard

Abbreviations and Acronyms : The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).
The standard abbreviations and acronyms used in this document can be looked up in reference literature (e.g. scientific dictionaries) and/or websites.

ACGIH = American Conference of Governmental Industrial Hygienists
ADR = European Agreement concerning the International Carriage of Dangerous Goods by Road
AICS = Australian Inventory of Chemical Substances

ASTM = American Society for Testing and Materials
BEL = Biological exposure limits
BTEX = Benzene, Toluene, Ethylbenzene, Xylenes
CAS = Chemical Abstracts Service
CEFIC = European Chemical Industry Council
CLP = Classification Packaging and Labelling
COC = Cleveland Open-Cup
DIN = Deutsches Institut fur Normung
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
DSL = Canada Domestic Substance List
EC = European Commission
EC50 = Effective Concentration fifty
ECETOC = European Center on Ecotoxicology and Toxicology Of Chemicals
ECHA = European Chemicals Agency
EINECS = The European Inventory of Existing Commercial Chemical Substances
EL50 = Effective Loading fifty
ENCS = Japanese Existing and New Chemical Substances Inventory
EWC = European Waste Code
GHS = Globally Harmonised System of Classification and Labelling of Chemicals
IARC = International Agency for Research on Cancer
IATA = International Air Transport Association
IC50 = Inhibitory Concentration fifty
IL50 = Inhibitory Level fifty
IMDG = International Maritime Dangerous Goods
INV = Chinese Chemicals Inventory
IP346 = Institute of Petroleum test method N° 346 for the determination of polycyclic aromatics DMSO-extractables
KECI = Korea Existing Chemicals Inventory
LC50 = Lethal Concentration fifty
LD50 = Lethal Dose fifty per cent.
LL/EL/IL = Lethal Loading/Effective Loading/Inhibitory loading
LL50 = Lethal Loading fifty
MARPOL = International Convention for the Prevention of Pollution From Ships
NOEC/NOEL = No Observed Effect Concentration / No Observed Effect Level
OE_HPV = Occupational Exposure - High Production Volume
PBT = Persistent, Bioaccumulative and Toxic
PICCS = Philippine Inventory of Chemicals and Chemical Substances
PNEC = Predicted No Effect Concentration
REACH = Registration Evaluation And Authorisation Of Chemicals
RID = Regulations Relating to International Carriage of Dangerous Goods by Rail
SKIN_DES = Skin Designation
STEL = Short term exposure limit
TRA = Targeted Risk Assessment

TSCA = US Toxic Substances Control Act
TWA = Time-Weighted Average
vPvB = very Persistent and very Bioaccumulative

Further information

Training advice :

Provide adequate information, instruction and training for operators.

Other information : This product is classified as H304 (May be fatal if swallowed and enters airways). The risk relates to potential for aspiration. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific hazard and included within Section 8 of the SDS. An exposure scenario is not presented.

A vertical bar (|) in the left margin indicates an amendment from the previous version.

Sources of key data used to compile the Safety Data Sheet :

The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).

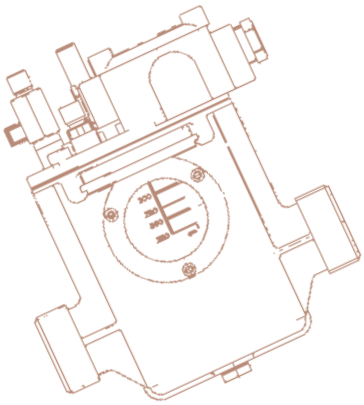
This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

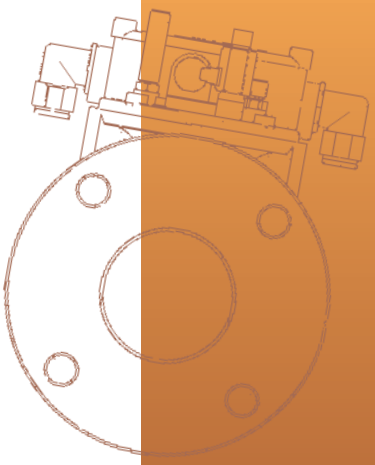
SECTION 8

APPENDIX B

BUCHHOLZ RELAY:
ABB/COMEM BS50LA

(MANUFACTURER DETAILS - 18 PAGES)





GAS-ACTUATED RELAYS

BUCHHOLZ TYPE

ACCORDING TO

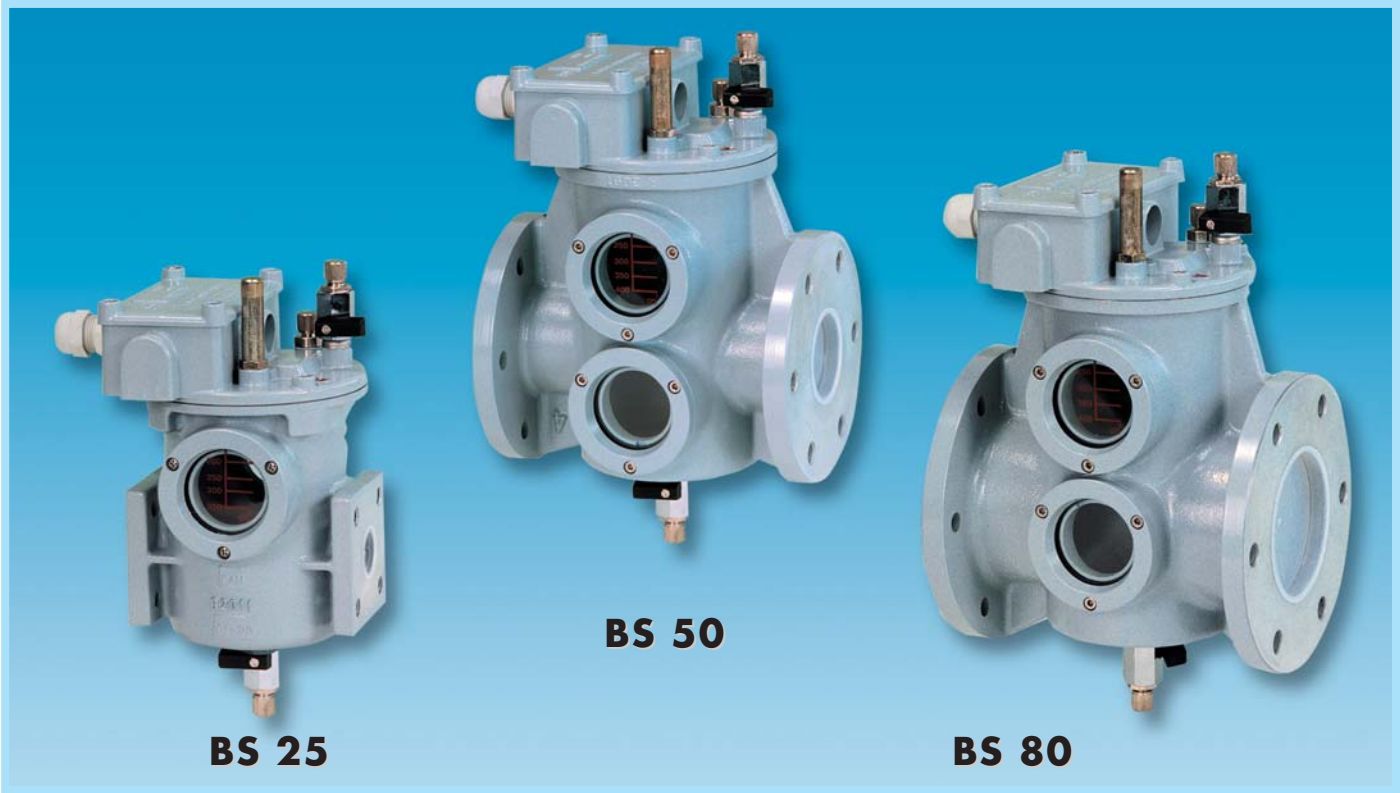
CENELEC EN 50216-2 STANDARD

AND

GAS SAMPLING DEVICE

comem®

GAS-ACTUATED RELAYS BUCHHOLZ TYPE



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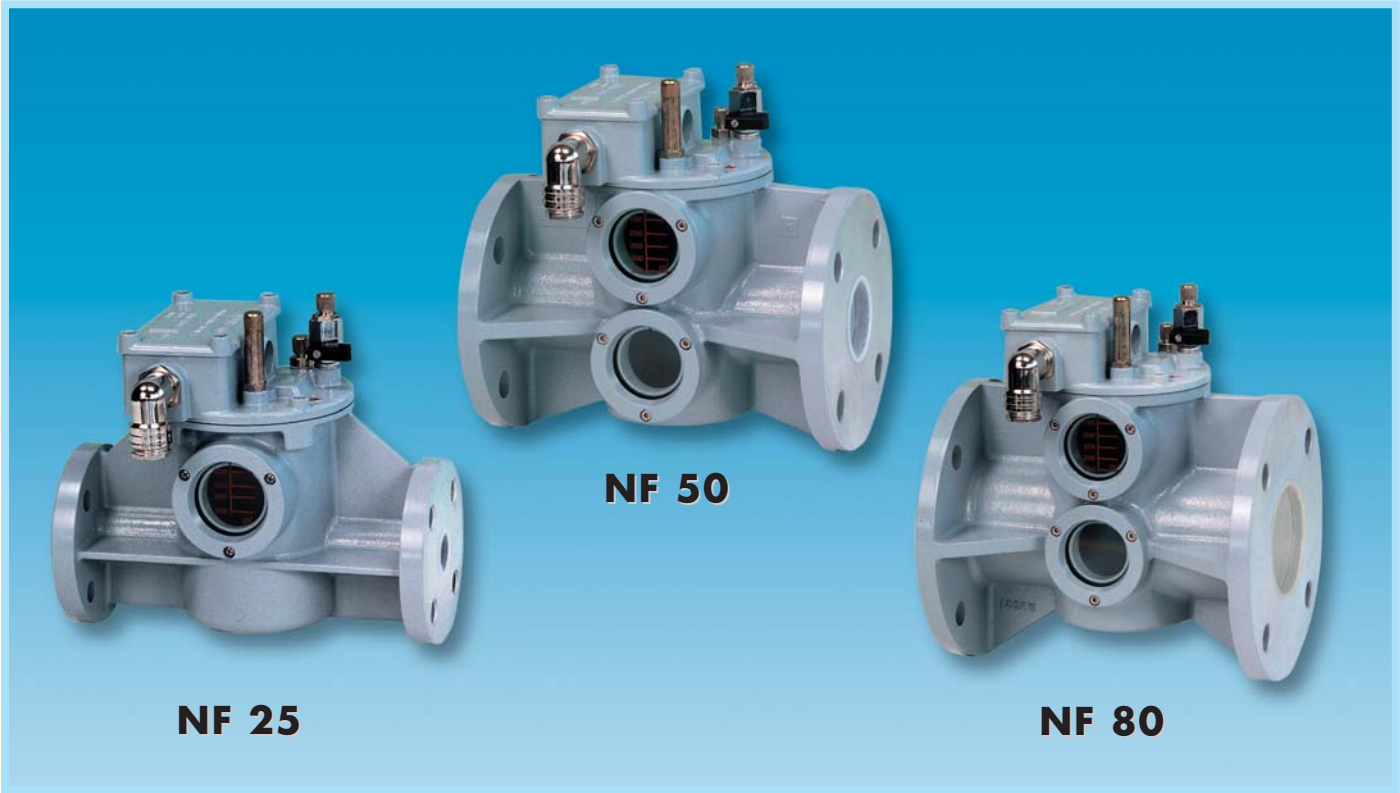
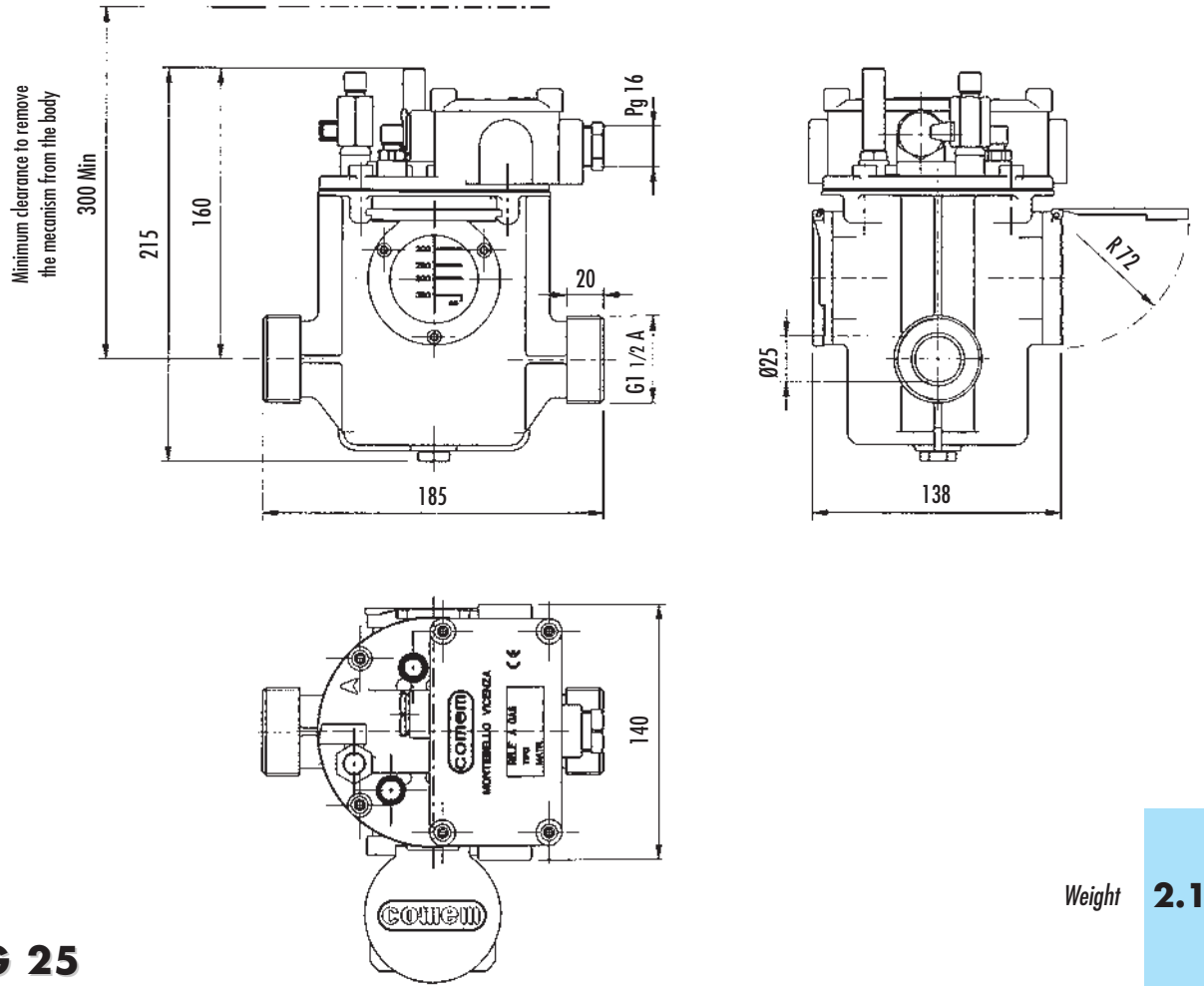
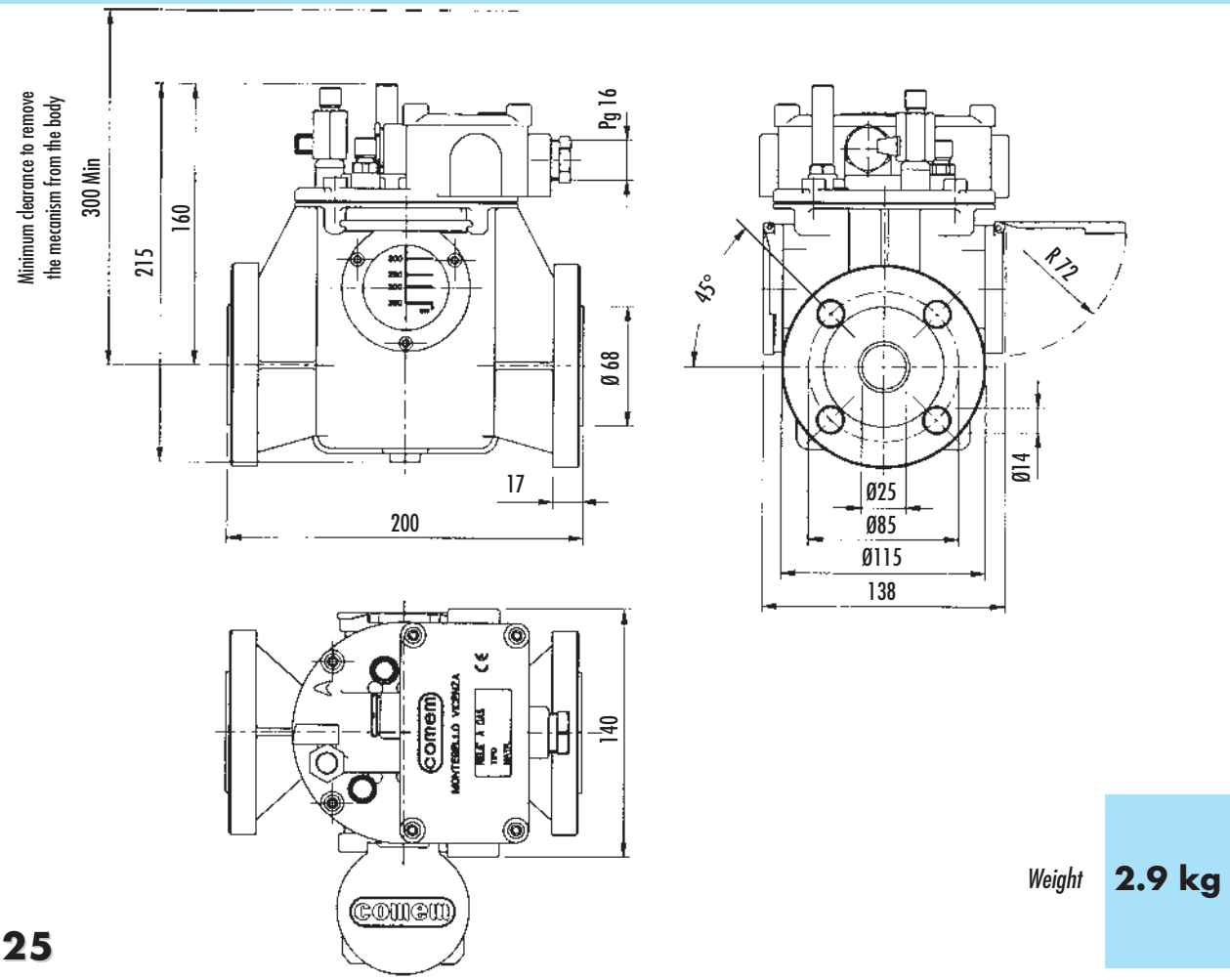




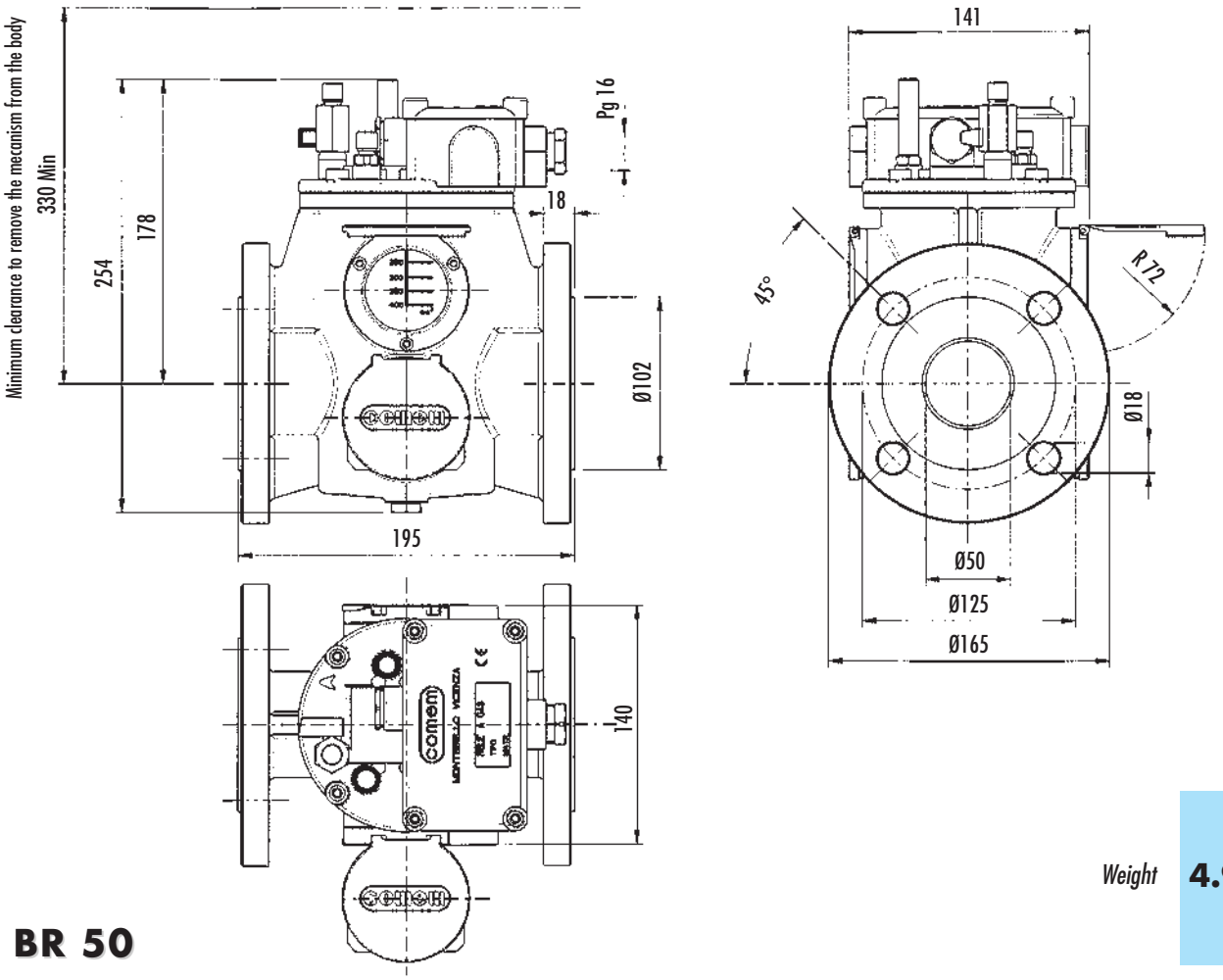
BG 25

Weight **2.1 kg**



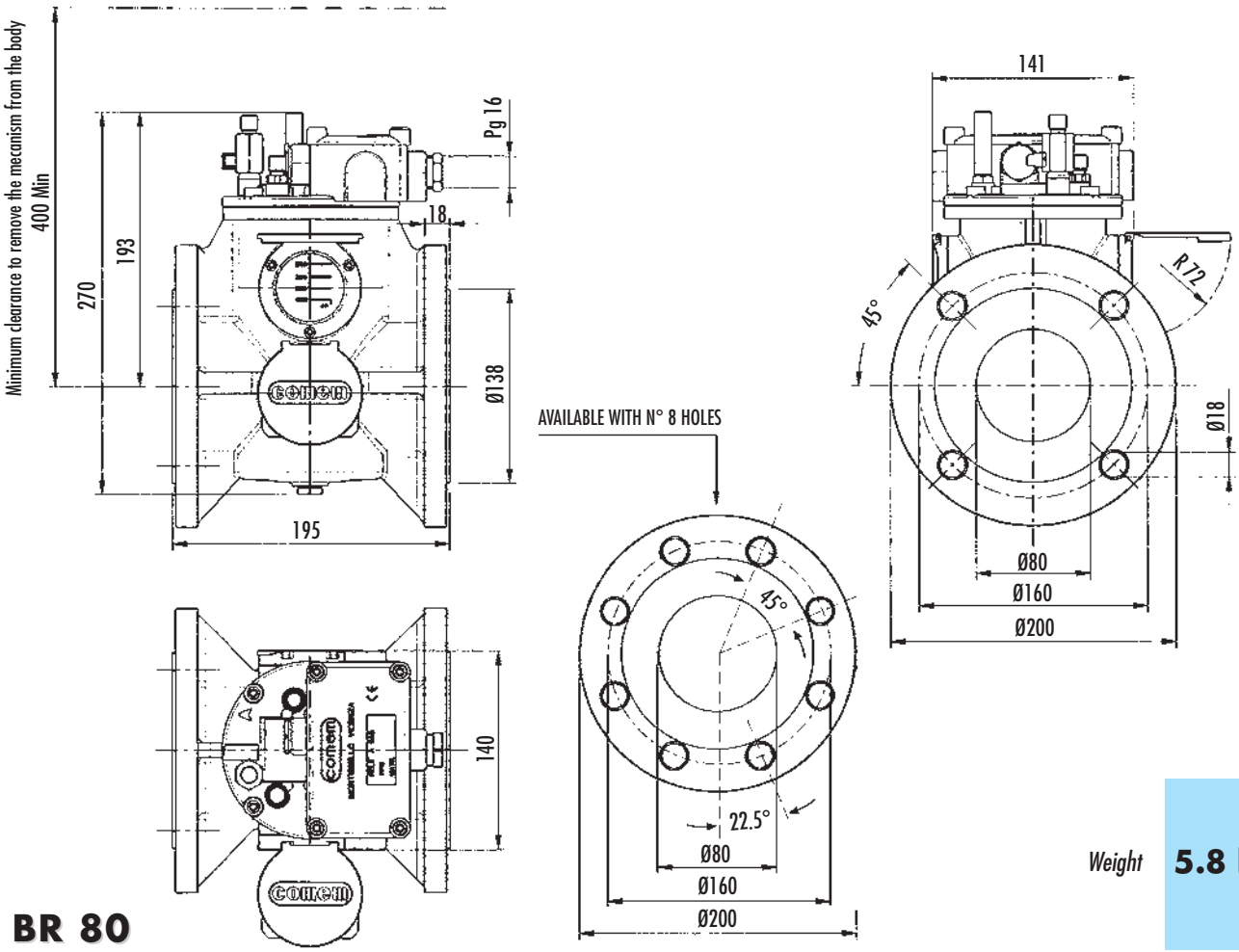
BR 25

Weight **2.9 kg**



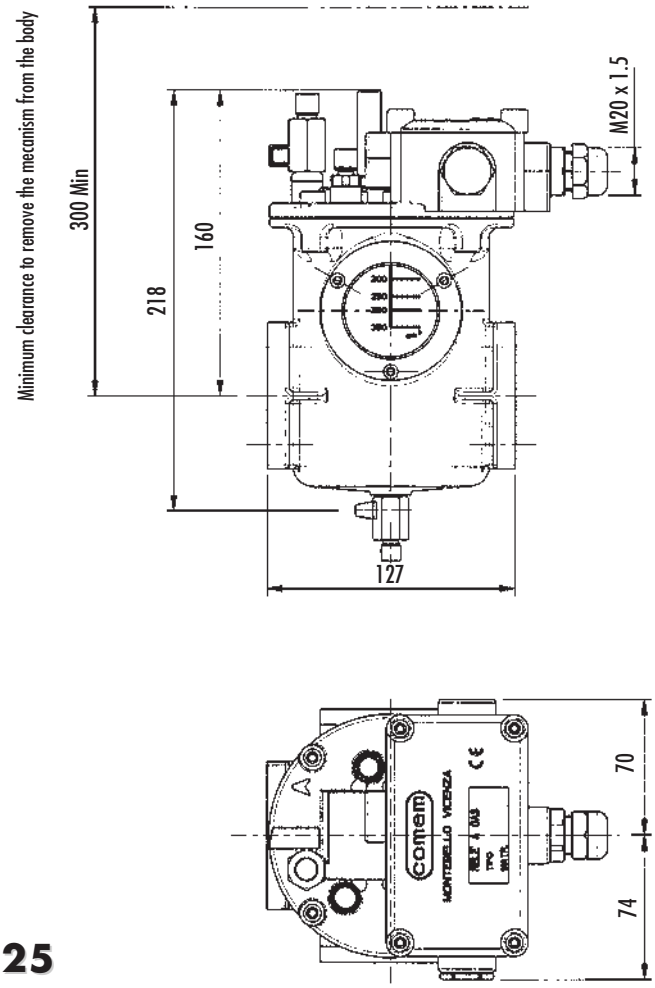
BR 50

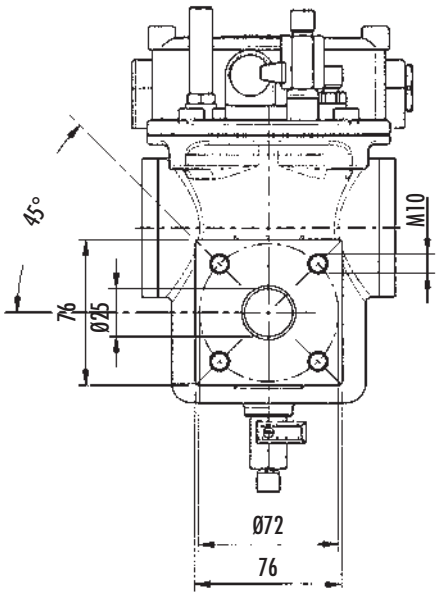
Weight **4.9 kg**



BR 80

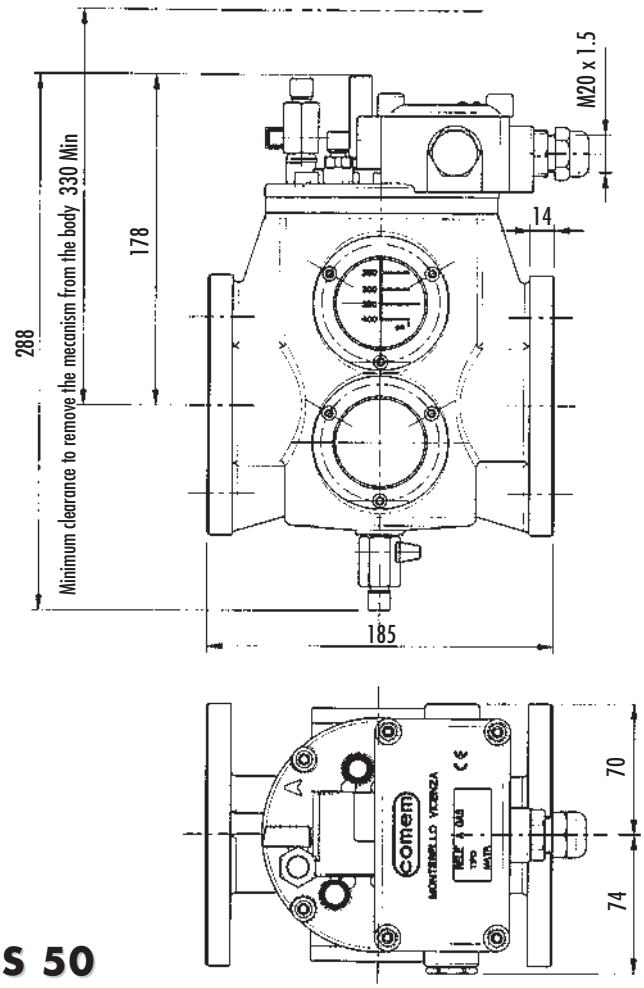
Weight **5.8 kg**

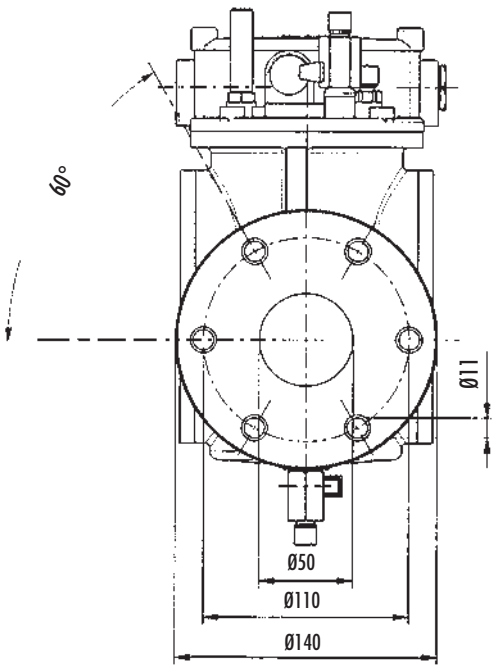




BS 25

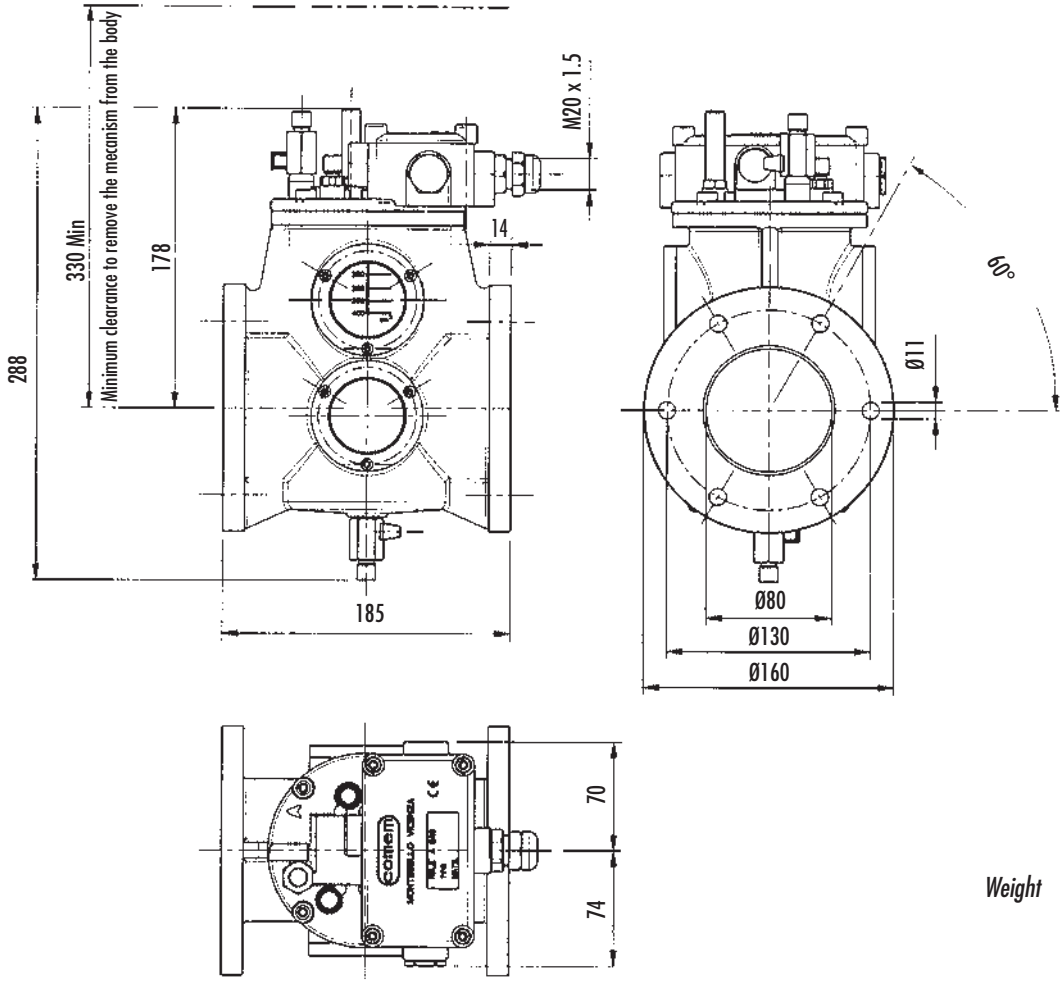
Weight **2.2 kg**





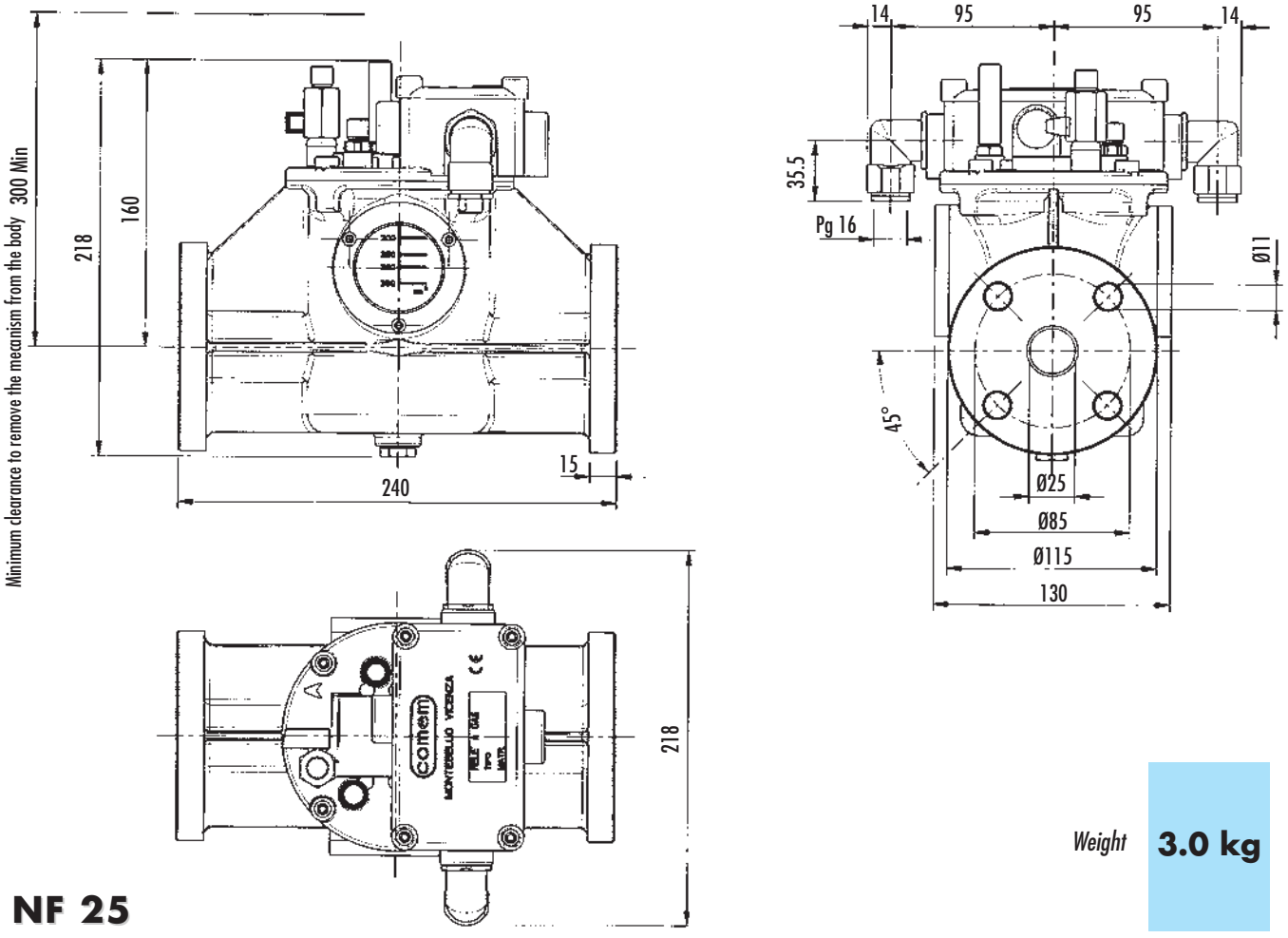
BS 50

Weight **4.1 kg**



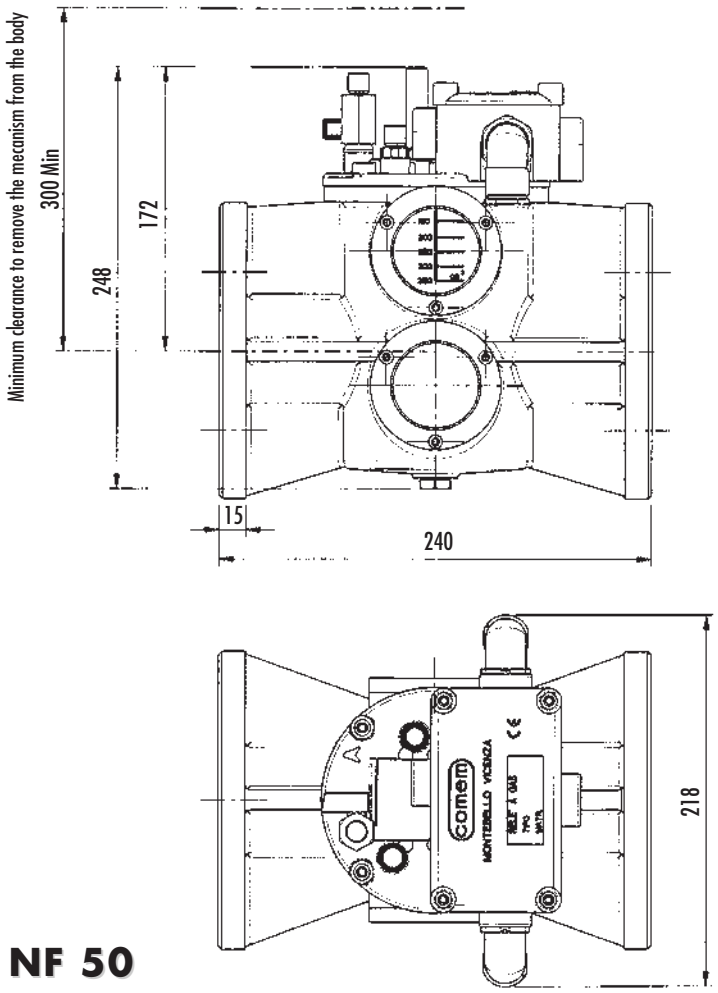
BS 80

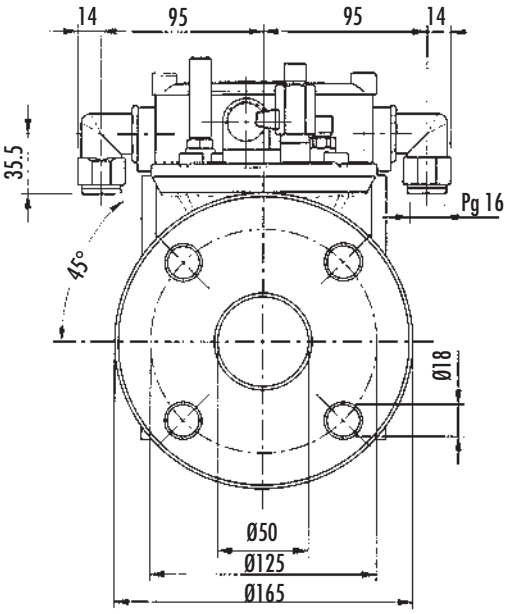
Weight **4.3 kg**



NF 25

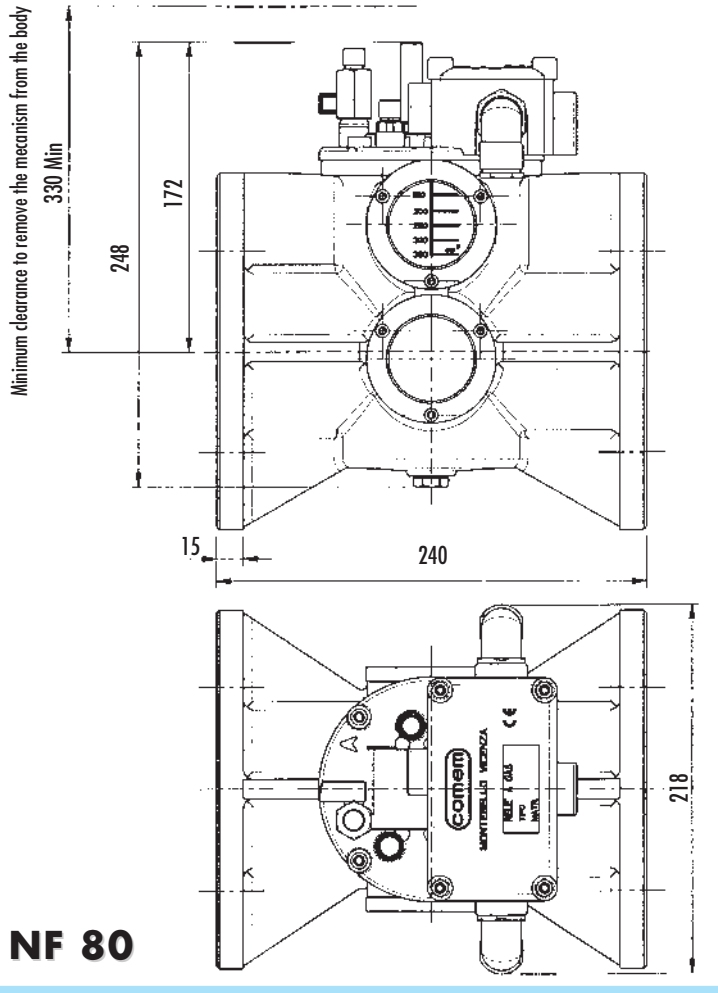
Weight **3.0 kg**

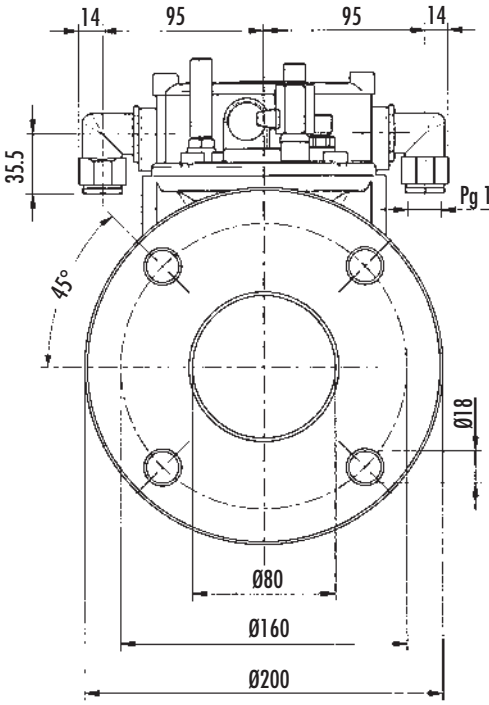




NF 50

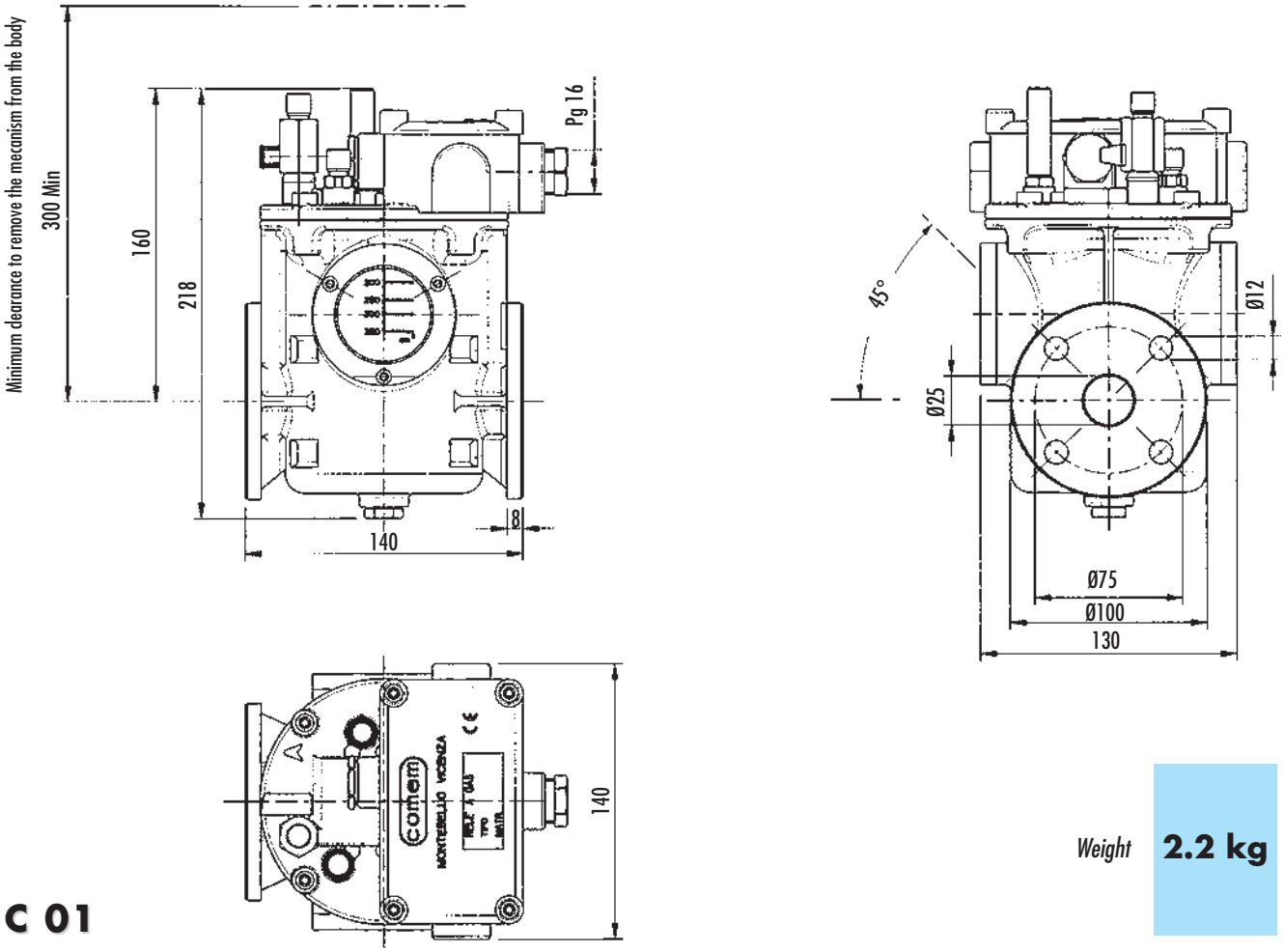
Weight **4.8 kg**





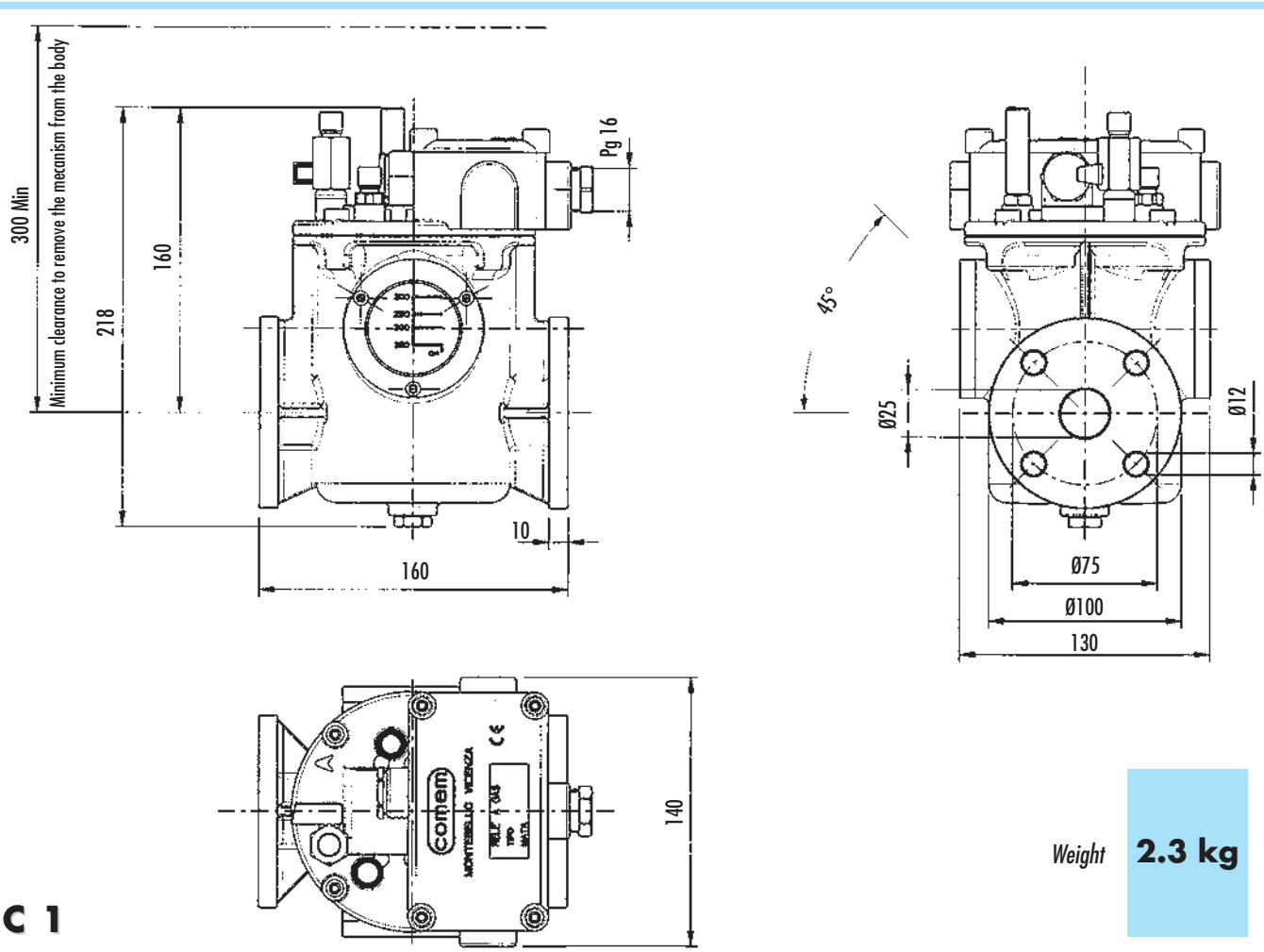
NF 80

Weight **5.5 kg**



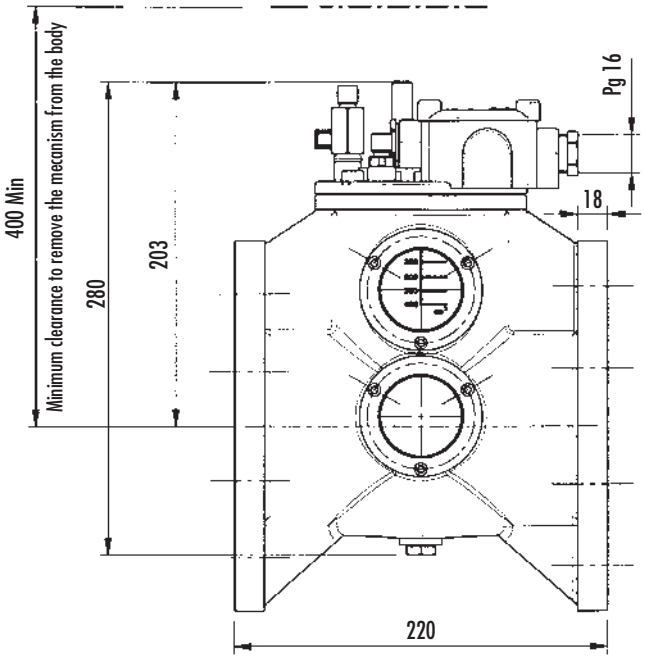
C 01

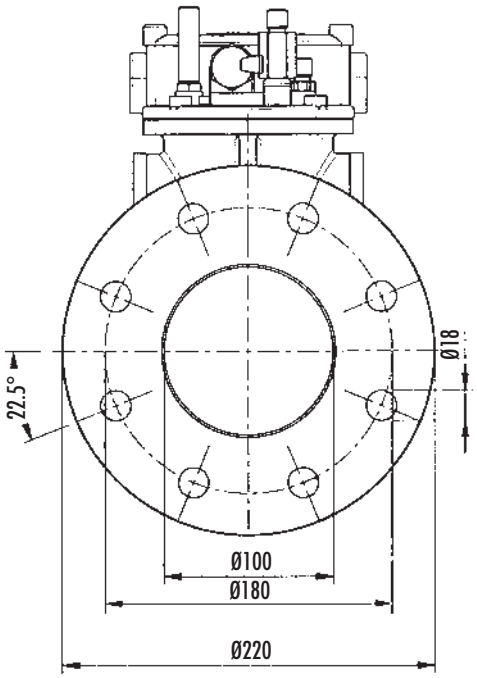
Weight **2.2 kg**

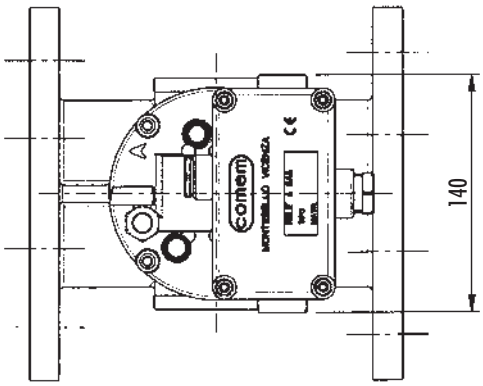


C 1

Weight **2.3 kg**







C 4

Weight **5.9 kg**

BUCHHOLZ GAS-ACTUATED RELAY
to CENELEC EN 50216-2 standard

The generation of gas in an oil filled trasformer is a clear indication of a problem. The gas may be a result of the following:

- Decomposition/degradation of solid, or liquid insulation inside the transformer due to overheating, or arcing.
- From the outside towards the pipeline.
- From the oil itself due to unsatisfactory de-gassing prior to filling.

Rapid oil movement in the pipeline towards the conservator is caused by an internal arc, short circuit, or hot spot which must be correctely addressed.

Oil leaks from the transformer are environmentally unacceptable and a fire hazard will lead to transformer failure.

To indicate any of the above malfunctions Comem as the result of 40 years experience with these products has developed a new "Buchholz" relay to comply fully with the latest CENELEC EN 50216-1 and EN 50216-2 standards.

The new relay incorporates the very latest technology in its construction.

PRINCIPLE OF OPERATION

The Buchholz relay is sited in the pipework between the transformer and its conservator and it is filled with oil during normal transformer operation. When gas is generated in the transformer it rises towards the conservator and collects in the upper chamber of the relay.

The oil level drops and the top float triggers alarm switch.

Gas shall not freely pass from the relay body and escape into the pipewoek before the alarm contact has operated.

The trip contact shall operate at a steady oil flow as indicated in Table 3.

This operation shall not be adversely affected when the alarm contact has already closed and gas is escaping freely.

In the event of an oil leak the Buchholz relay will only operate after the conservator has exhausted all of its oil. In order to check this eventuality it is recommended that an RDR MK II automatic shutter valve is fitted between the Buchholz and the conservator.

Specific information on this product are available on request.

CONSTRUCTION

The new Comem Buchholz relay is an assembly of two machined aluminium alloy castings that effect a perfect oil seal.

1) The main body of the relay is fitted with tempered glass inspection windows with graduated scale markings in cubic centimetres to indicate the internal volume. The oil drain plug is located at the bottom of the main body.

2) The top cover carries the frame which contains the moving parts of the relay. These comprise the two floats and their associated switches encapsulated in glass bulbs, one calibrated flow valve and two permanent magnets.

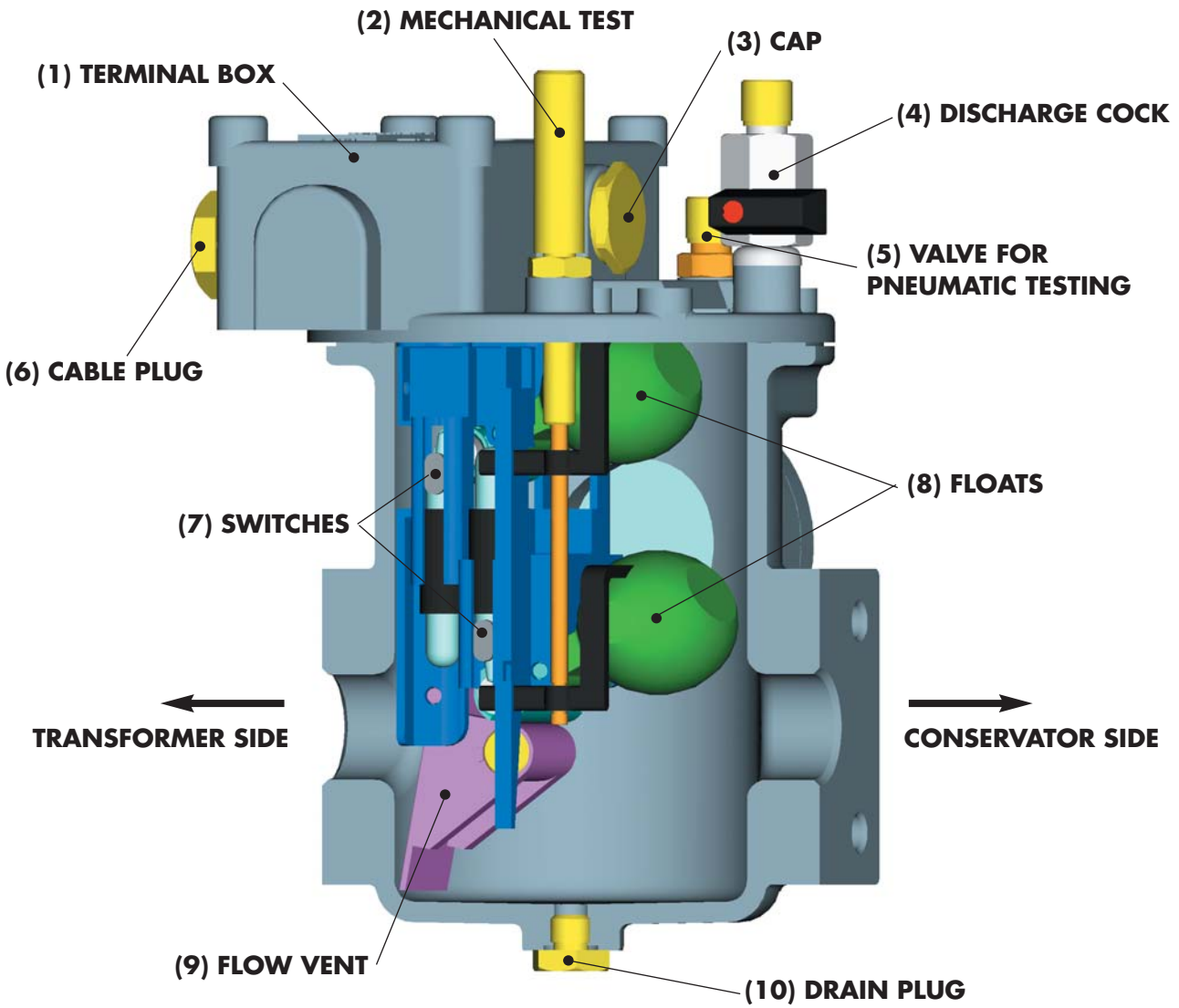
The cover also carries:

(4) a gas discharge valve with G1/8" in male thread with protective cap.

(5) A valve for pneumatically testing the alarm and insulation circuits, with protective cap.

(2) A push rod for mechanically tripping the alarm and the insulation circuits, with protective cap.

A terminal box which as standard contains 4 numbered M6 terminals and one earth terminal.



EXTERNAL COATING AND PROTECTION

To the external aluminium alloy parts is given a phosphate treatment prior to applying one coat of vinyl enamel, colour RAL 7001. This treatment has proved more than satisfactory over the years for the majority of applications including desert and tropical situations. However, in particularly severe applications (>500h salt fog) such as applications in corrosive atmospheres (acids) a suitable epoxy primer is recommended. (This should be discussed at the time of selection).

All external brass fittings are plated and all nuts are made in stainless steel.

RELAY SELECTION

The size and type of relay to be used will depend on the transformer rating and oil volume. Suggestions are given in the following table but the final choice is often as a result of the transformer manufacturers experience.

MVA TRANSFORMER POWER	NOMINAL DIAMETER
Up to 5	25
From 5 up to 20	50
From 20 up to 50	80
Over 50	100

tab. 1

TECHNICAL DATA

- The relay pipework is typically mounted at 2,5 degrees to the horizontal. A positive inclination of up to 5 degrees to the horizontal axis is admissible.
- Operating pressure - 1 bar, tested to 2,5 bar for 2 minutes at 100 deg C.
- Gas volume to trip alarm:

BUCHHOLZ RELAY TYPE	GAS VOLUME NECESSARY TO TRIP THE ALARM
BG 25, BR 25, NF 25, C 01 , C 1	100÷200
NF 50, NF 80	100÷200
BR 50 , BR 80, C 4	150÷250
BS 25	170÷230
BS 50, BS 80	250÷300

tab. 2

- Rate of oil flow in m/s to trip insulation. In the following table standard values are highlighted with an '**O**' available, on request with an '**X**' and not available with a '**//**'. +/- 15% tolerance at 20°C with oil viscosity according to IEC296.

INSIDE PIPE DIAMETER	1,0 m/s	1,5 m/s	2,0 m/s
25	**O**	**X**	**X**
50	**O**	**X**	**X**
80	**O**	**X**	**X**
100	//	**O**	**X**

tab. 3

- The relay operates within 0,5 seconds.
- Oil temperature between -25 and +115 deg C.
- Ambient temperature between -25 and +60 deg C.
- Degree of Protection IP65 to EN 60529.

SWITCH ELECTRICAL DATA

Rated switch current is **2 A r.m.s**. with max. **10 A r.m.s.** as short term 30 ms current value.
Breaking power is specified in the following table:

VOLTAGE	CURRENT	BREAKING POWER	
220 V d.c. (min. 12 V)	2 A for 10000 maneuvers	250 W	L/R < 40 ms
230 V a.c. (min. 12 V)	6 A for 1000 maneuvers	400 VA	cos φ > 0,5

tab. 4

Dielectric contact voltage as specified in the following table:

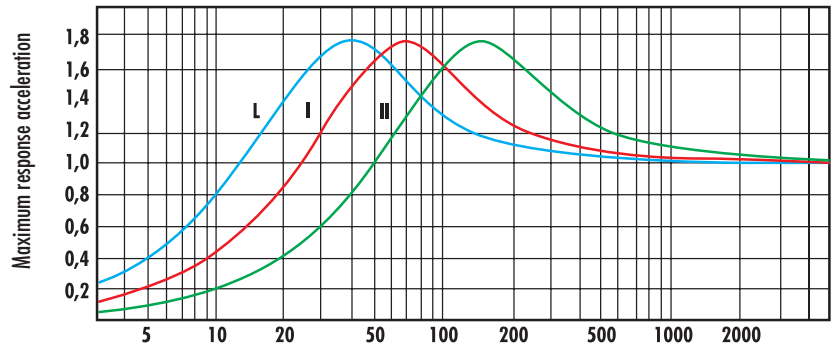
	SHORT TERM INDUSTRIAL FREQUENCY LEAKAGE TEST kV/1 min. (r.m.s)	RESISTANCE VOLTAGE PER PULSE kV (peak)
Between circuits and ground	2.5	5
Across open contacts	1	3

tab. 5

TESTING

The following Type Tests have been performed on the relay.

- Measurement of the volume of gas necessary to trip the alarm.
- 500 hr salt fog.
- Electromagnetic Field Test. Relay does not trip in field strength up to **25 mT** (ref EN 50216-2).
- Stationary sinusoidal mechanical vibrations. Tests according to EN 60721-3-4 standards have been performed.
  a) class **4M4** (4M6 on request) vibration test applied in sites where vibrations are transmitted from machinery and vehicles. Not suitable for machines exposed to high vibration and shock levels. Three-axis movement was impressed to the relay using special equipment with stationary sinusoidal vibrations from **2** to **200 Hz.** Movement had a constant **3 mm** (6 mm peak-peak) amplitude in the range from **2** to **9 Hz** whereas above this frequency it had constant **10 m/s²** acceleration. The alarm and release switches did not trip.
  b) non-stationary vibration tests with vertical shock with **100 m/s²** acceleration with type I spectrum (duration 11 ms) as shown in the graph below. Alarm and release contacts did not trip. On demand we are able to manufacture Buchholz relays with special features and test values higher than the ones stated above.



Example duration of a sinusoidal half pulse:

Type L spectrum: 22 ms duration

Type I spectrum: 11 ms duration

Type II spectrum: 6 ms duration

- A seismic test was also performed according to EN 50216-1 standards that refers to EN 60068-3-3 class 0, level 2 standards. The test consists of application of a **9 m/s²** horizontal acceleration and a **4.5 m/s²** vertical acceleration, increasing frequency one octave per minute. No activation of alarm or release switches was encountered.
- Pressure Withstand Test 2.5 bar for 2 minutes with oil at 100 deg C.
- Vacuum Withstand Test of 2500 Pa for 24 hrs.
- Rate of oil flow test to operate trip contcts, (as shown in table 3).
- Test to show the relay is insensitive to oil flow from conservator to transformer.
- Electrical tests per table 5.

ROUTINE TESTS

The following Routine Tests are applied to all relays.

- Hydraulic seal test in mineral oil at 90 deg C and 100 kpa pressure for 30 minutes.
- Contact operation via mechanical push rod.
- Contact operation by lowering the oil.
- Rate of oil flow to trip contacts.
- Electrical withstand test between contacts (as table 5).
- Electrical withstand test between contacts and earth (as table 5).

An individual routine Test Report is shipped with each relay

RELAY OPERATING TEST

The following site Tests can be performed when the relay is installed on the transformer
The Alarm and Trip contacts can be tested manually by the push rod (2) - mechanical test, or (only for alarm contact) by the introduction of air into the relay through valve (5) - pneumatic test.
A bicycle pump can be utilised for this test or a kit article n° **5400806002** is available from Comem.
To effectively test the rate of flow of oil is a complex test requiring specialised equipment. Should this test be required other than as a type test then Comem can perform this on request at the time of the order.

INSTALLATION INSTRUCTIONS

The following installation procedures must be observed for proper relay operation:

- The red arrow on the relay must point towards the conservator.
- The relay must always be full of oil, which means that the minimun oil level in the conservator must be higher than the relays breather valve.
- The recommended inclination of the relay pipework is 2.5 degrees from the horizontal.
- The pipe from the transformer to the relay must exit the transformer at the highest point.
- The pipeline upstream from the relay has to be straight and with a length equal to **5-10 times** the pipeline diameter, at least. Down stream from the relay, pipeline length has to be **3 times** the pipeline diameter, only. It must rise up towards the conservator.

RELAY ORDER FORM

Chosen size and model (see drawings and table 1):

BG 25	BR 25	BR 50	BR 80	BR 80 8 holes	BS 25	BS 50	BS 80	NF 25	NF 50	NF 80	C 01	C 1	C 4
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Electric contact layout (meaning with relay filled with oil and operating):

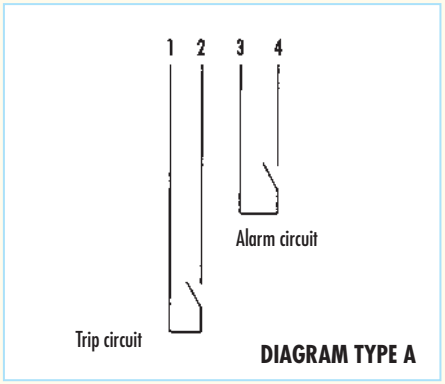


DIAGRAM TYPE A

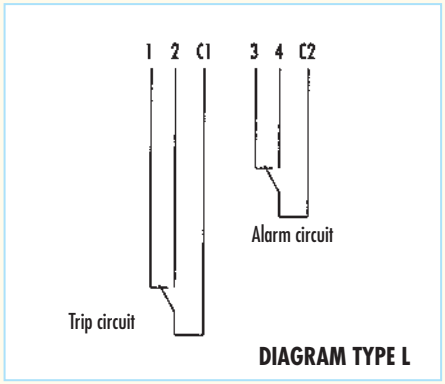
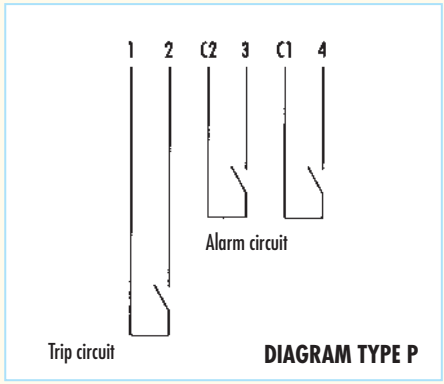


DIAGRAM TYPE L



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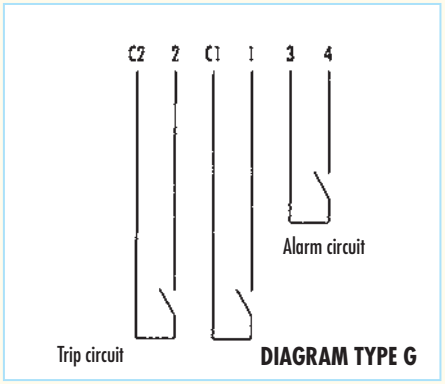

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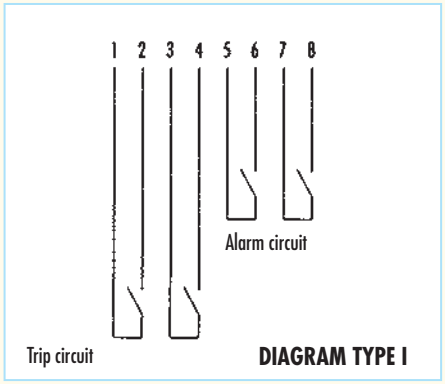

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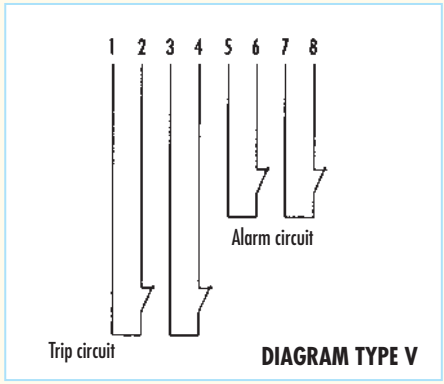


DIAGRAM TYPE V

A	L	P	G	I	V	Other
☐	☐	☐	☐	☐	☐	☐ _____

Chosen seals:

A	B	C	Other
☐	☐	☐	☐

	TYPE OF DIELECTRIC / AMBIENT TEMPERATURE/OIL		MINERAL	SILICONE	ESTERIZED
A	Ambient -25° ÷ 60° C Oil -25° ÷ 115° C	Standard version	NBR	VITON/NBR	//
B	Ambient -10 ÷ 60° C Oil -10° ÷ 115° C	Special version	//	VITON	VITON
C	Ambient -40° ÷ 60° C Oil -40° ÷ 115° C	Special version	NBR/VITON	NBR/VITON	NBR/VITON

(NBR/VITON: meaning: parts in contact with oil in VITON, parts not in contact with oil in NBR) tab. 6

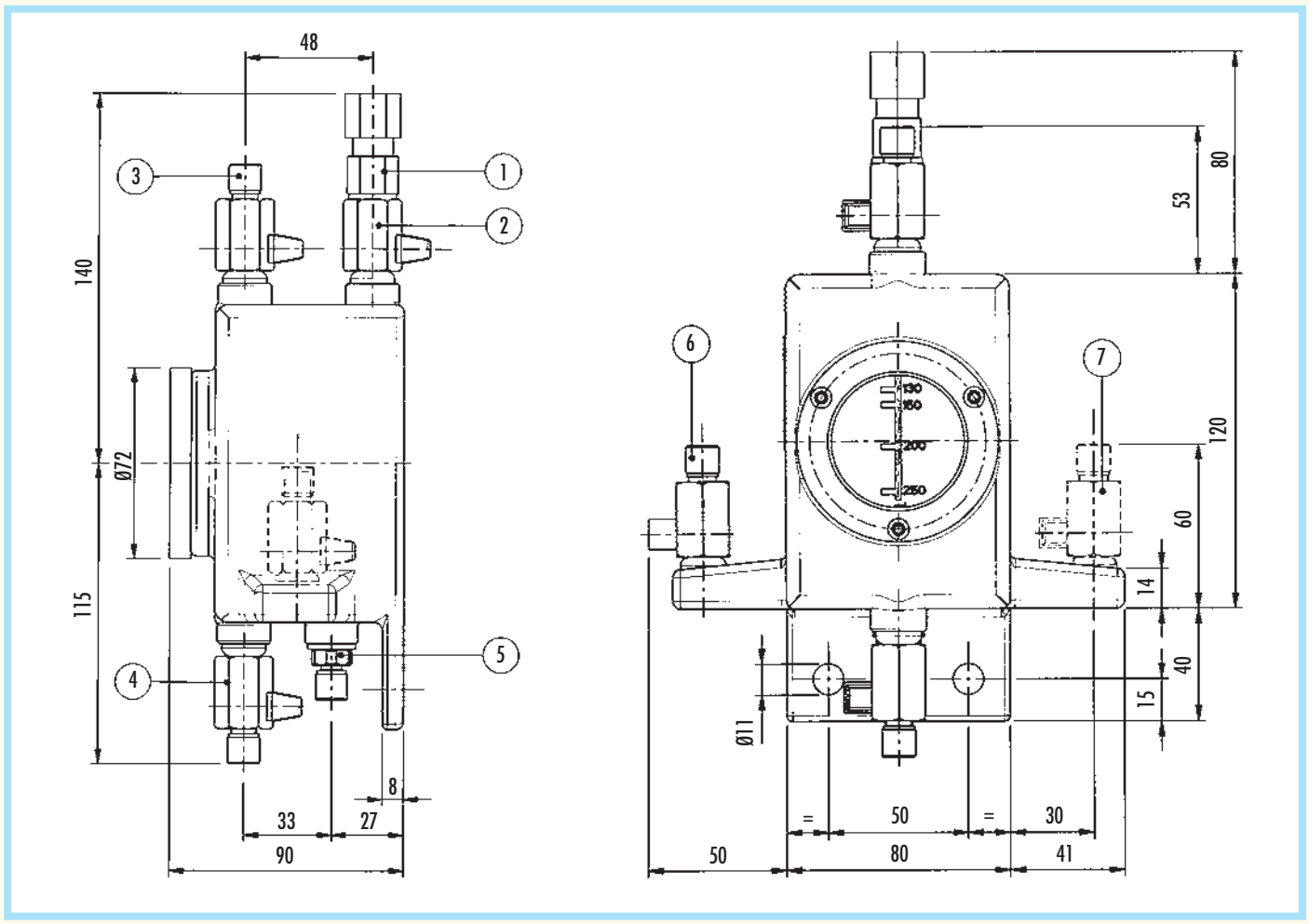
Paint finish:

Standard	Corrosive environments	Other special finishes
☐	☐	☐ _____

GAS SAMPLING DEVICE WITH APPLICATION OF THE BUCHHOLZ RELAY OIL DRAIN COCK

PRINCIPLE OF OPERATION

The presence of gas inside an oil filled transformer is always a sign of malfunction and one of the tasks of the Buchholz relay is to signal this presence. Analysis of the evolved gas can often give good indication of the type of malfunction but accessing the Buchholz relay during live operation of the transformer can be hazardous.
The gas sampling device has been designed to overcome this problem by siting the unit remote from the Buchholz and in a readily accessible position typically on the side of the transformer.

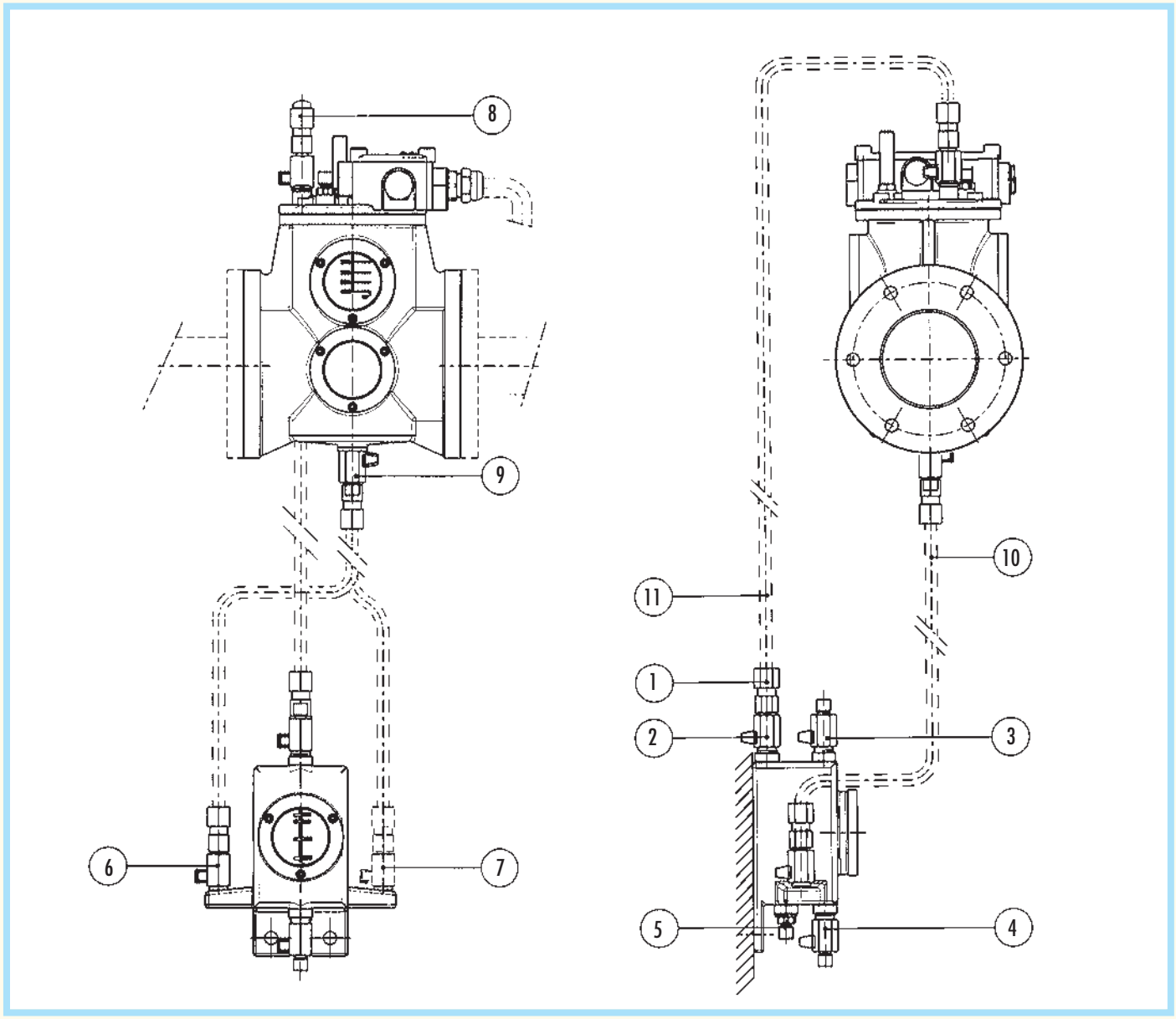


CONSTRUCTION

The Comem gas sampling device is manufactured from an aluminium alloy casting with the following fittings:
- A tempered glass inspection window with graded markings for volume indication.
- A gas sampling valve (2).
- A bleed valve (3).
- A gas inlet valve for pneumatic testing (5).
- A valve for draining oil from the relay (this can be mounted on the right or left hand side of the body (6) or (7).

As a routine test all castings are tested by injecting ambient air at 2.5 bar for 2 minutes.
A certificate to this effect is supplied with the unit.

For the sake of standardisation the device is fitted with the left and right hand valve supports but only one valve.
Customer can then choose which side he prefers.
- With fittings for outside dia. 10 tubes, code **1RDPG00005** (standard);
- with fittings for outside dia. 6 tubes, code **1RDPG00006** (on request);
- with fittings for outside dia. 8 tubes, code **1RDPG00007** (on request).



DESCRIPTION OF OPERATION

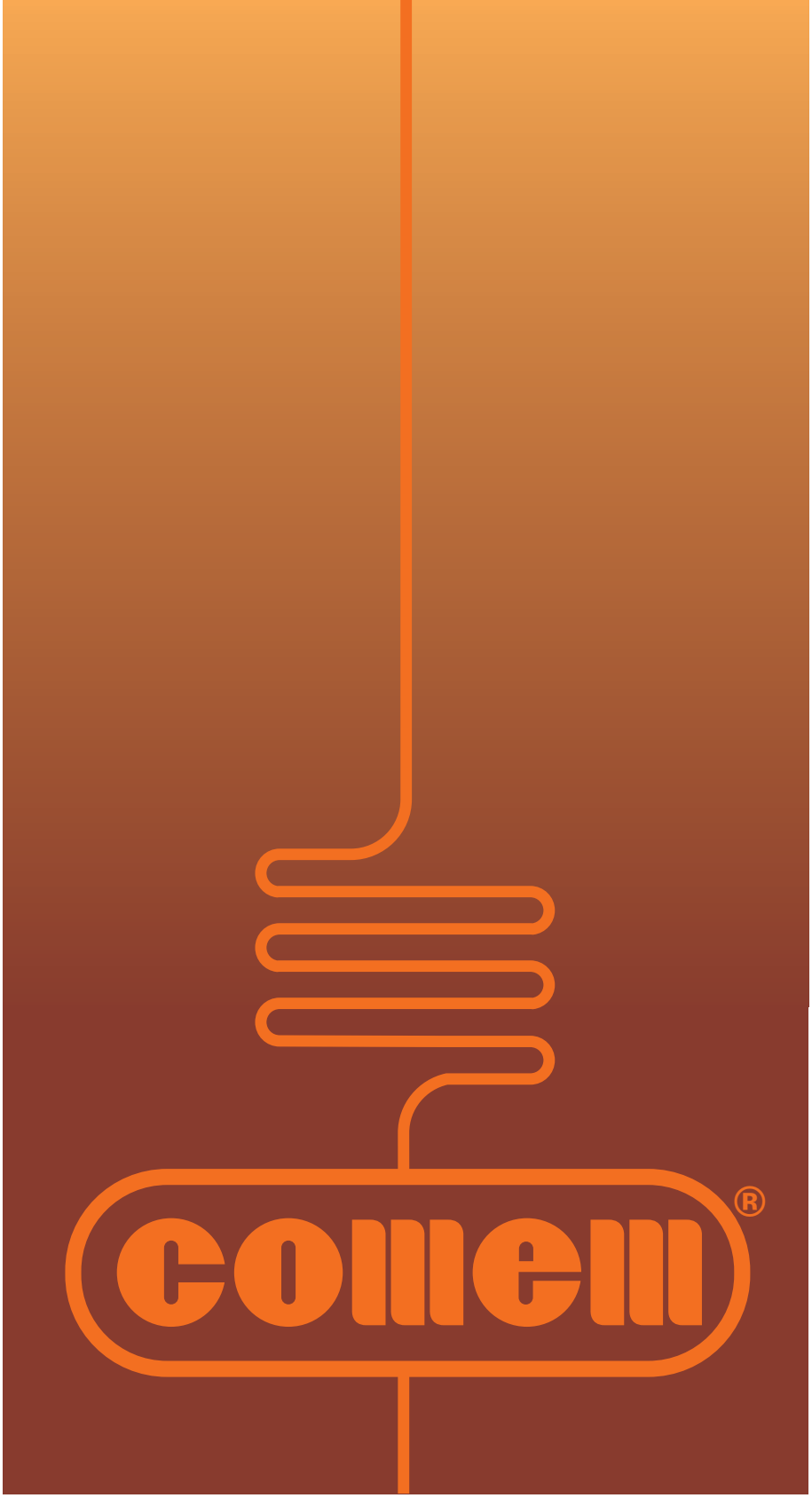
During normal operation the Buchholz relay is full of oil and is connected to the gas sampling device via pipelines 10 and 11.
Valves (8), (2) and (9) are open.
Valves (3), (4), (6) or (7) are closed.
The gas sampling device is consequently also full of oil.
Sampling procedures are as follows:
A- To sample oil: open valve (6) or (4).

B- To sample gas if the relay has signalled alarm or tripped the transformer:
Open valve 4 and let the oil in the device flow out. This draws any gas from the relay via valve (8), tube (11) and valve (2) into the body of the gas. The progress of this operation can be checked through the inspection window. When the desired amount of gas has been collected close valves (2) and (4) and open valve (3) to take the sample.

C- To test satisfactory operation of the alarm and trip circuits proceed as follows:
Close valve (2) then drain all the oil from the device by opening valves (3) and (4). Attach an air pump (bicycle pump) or kit from Comem 5400806002) to valve (5). Close valves (3) and (4) and pump fast whilst simultaneously opening valve (2). The air will then pass into the upper chamber of the Buchholz relay via pipeline (11) lowering the floats and consequently closing their contacts. If you wish to test the lower float then first the valve between the relay and the conservator must be closed to prevent air from flowing directly into the conservator.

OPERATION STARTING

Caution: After commissioning ensure the Buchholz relay and the sampling device are both filled with oil.



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SECTION 9

APPENDIX C

PRESSURE RELIEF DEVICE:
ABB/COMEM 50M

(MANUFACTURER DETAILS - 8 PAGES)

Pressure Relief Device - M

COMEM "M" pressure relief devices are used to control pressures inside tanks. They are used where accidental, instantaneous and uncontrolled increases in pressure may create the danger of explosion. They are designed to discharge the pressure increases that have taken place to the exterior in a very short time period (a few thousandths of a second).
They are widely used in the metal tanks of oil-cooled electric transformers. Sudden and violent short circuits inside these tanks, in fact, instantly generate an enormous amount of gas with a great increase in interior pressures. If the pressure cannot discharge to the exterior there is danger that the transformer may explode, with all the possible harm and damages this may cause. This danger can be prevented by installing one or more pressure relief device with discharge sizes proportional to the volume of oil contained in the transformer. It is always good practice to install these pressure relief devices in all situations where internal pressure values must not exceed specific safety limits.

M

They are widely used in large distribution transformers and traction transformers.

Total pressure relief completely opening

Pressure relief device opening is total each time the pressure relief device operates for pressure settings between 20 and 90 kPa. The discharge opening area, for each pressure relief device operation, is equal to that for higher pressure settings even when pressure settings are lower than 20 kPa. If, however, pressures are generated inside the tank that are much higher than the setting then the spring, further compressed, allows the closing disk to create even larger discharge areas when it operates.

Operating performance

Nominal operating pressure: the pre-fixed overpressure value shall be agreed between supplier and purchaser within the standard range from 20 up to 90 kPa, with 10 kPa steps, with a tolerance of - 5 kPa to + 7 kPa. For model 50M the standard operating pressure range comes up to 200kPa, with 10kPa steps.

Construction

Our pressure relief devices are totally protected against external corrosion and against penetration of foreign bodies between cover and protective cap. This ensures perfect operating efficiency even for extended periods of time.

"M" pressure relief device

These consist of a flanged body and a corrosion-proof aluminium alloy disk. A brass rod that holds the spring is applied to the central part of the disk. There are two gaskets in the pressure relief device: a special shaped upper gasket and a lip seal.
When the pressure relief device is closed the upper gasket is pressed against the disk. The shape of the gasket permits a perfect seal even if the disk lifts 1-2 mm. The disk also makes a seal against the lip seal gasket as it moves upwards. If, due to interior pressure, the disk rises beyond this amount then the upper seal is no longer maintained while the lip seal remains.

At this instant the surface of the washer invested by internal pressure is multiplied in area as is the total force applied on the spring. This causes total and instantaneous opening of the pressure relief device which consequently discharges excess pressures to the exterior.
When pressure has been discharged the disk, pushed back by the spring, lowers down and closes the valve. As the disk moves downwards it first closes against the side gasket and then against the upper gasket.
This latter gasket, because of its special shape, is pressed down 1- 2 mm. and the disk moves further down, breaking the seal on the lip seal gasket. This releases any pressure that may have been trapped between the two gaskets. Now the pressure relief device is ready to work.

Routine tests

It is necessary to carry on operational tests, with compressed air:

- to check the correct functioning of the device at operating pressure values
- to check the functioning of the optic signal and of the electric contacts.

Installation guidelines

Our "M" pressure relief devices come in 2 sizes and have different discharge areas. This allows users to select the type that is best suited for the volume of oil contained in the tank. The following table gives guideline values:

Volume of oil tank:	Type of pressure relief device
up to 3000 dm^3	50 M*
up to 25000 dm^3	125 M*

* These guideline sizes are based on experience.

We recommend using multiple pressure relief devices when oil volumes exceed these levels. It is always good practice to use multiple pressure relief device with smaller discharge areas rather than a single pressure relief device with a large area. The reason for this, in the case of transformers, is that it is better to install one pressure relief device above each winding column since these are the points where maximum interior pressures are generated in case of a short circuit. Instantaneous pressure relief device opening implies direct contact between the closing disk and oil. For this reason the pressure relief device are equipped with a screw to bleed out air that may accumulate during oil tank filling procedures.

Oil tightness duct

It is a good practice to prevent harm to persons or property from violent jets of hot oil evacuating from the pressure relief device, for pressure relief device discharges to be ducted towards points properly designed to receive the hot oil. The protection of the environment is also another important target which has to be pursued by everybody. Our protection duct allows to drain the oil evacuated by the pressure relief device. The perfect hydraulic tightness of the system guarantees that not any drop of oil is dispersed in the environment, but collected through a pipe in a tank (pipe and tank are not supplied). The sealing oil duct is made of die-casted aluminium; a terminal flanged tube made of steel is also provided if someone wants to weld the pipeline. O-ring gaskets have been adopted for the duct sealing. Detailed assembling instructions are supplied with the equipment.

Pressure Relief Device - M

Visual signal that the pressure relief device is open

Pressure relief devices are equipped with a visual signal that shows when they have opened. This signal consists of a red knob that protrudes from the central part of the duct when the pressure relief device has opened. Just press it down in order to make it go back to its normal position and reset the switches, too.

Electrical signalling switch

Maximum 3 "pressure relief device open signal" contacts can be mounted on request. These are a fast tripping limit switch with switching contact contained inside a watertight room IP 65. The contacts simultaneously act with the visual signal.

The switches have the following characteristics:

Specifications:

Breaking and making capacity (NO and NC contacts)		
Voltage	**Uninterrupted current (making capacity)**	**Interrupted current (breaking capacity)**
24 VDC to 220 VDC	2 A	100 mA L/R<40 ms
230 VAC	2 A	2 A cos φ>0.5

Other characteristics:

- The pressure relief device is supplied with a "locking system" which allows the pressure relief device to be blocked during the transformer oil leakage test. The locking system has been tested to withstand max 2 bar pressureand can also be used during the transformer transport.
  WARNING!: the locking system must be removed before powering-up the transformer.
- The pressure relief device is supplied with a M25x1.5 cable gland.
- Colour: RAL 7001.

Outer surface protection

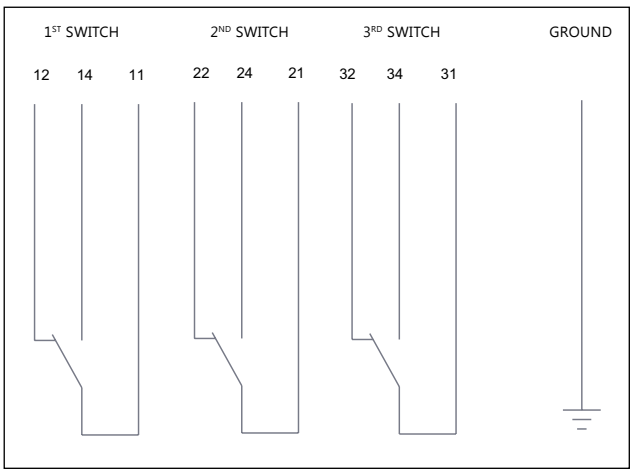
External surfaces are protected against weather corrosion. Aluminum alloy components are non-corroding and their surfaces are protected with a double layer of paint offering high level protection against all atmospheric agents and resisting temperature variations between -40 °C and +100 °C. Special painting for severe climate applications is also available on request.

Contact diagram

- FIRST SWITCH (terminals 12-14-11)
  change-over contact:
  – 14-11 normally open
  – 11-12 normally closed

- SECOND SWITCH (terminals 22-24-21)
  change-over contact:
  – 23-21 normally open
  – 21-22 normally closed

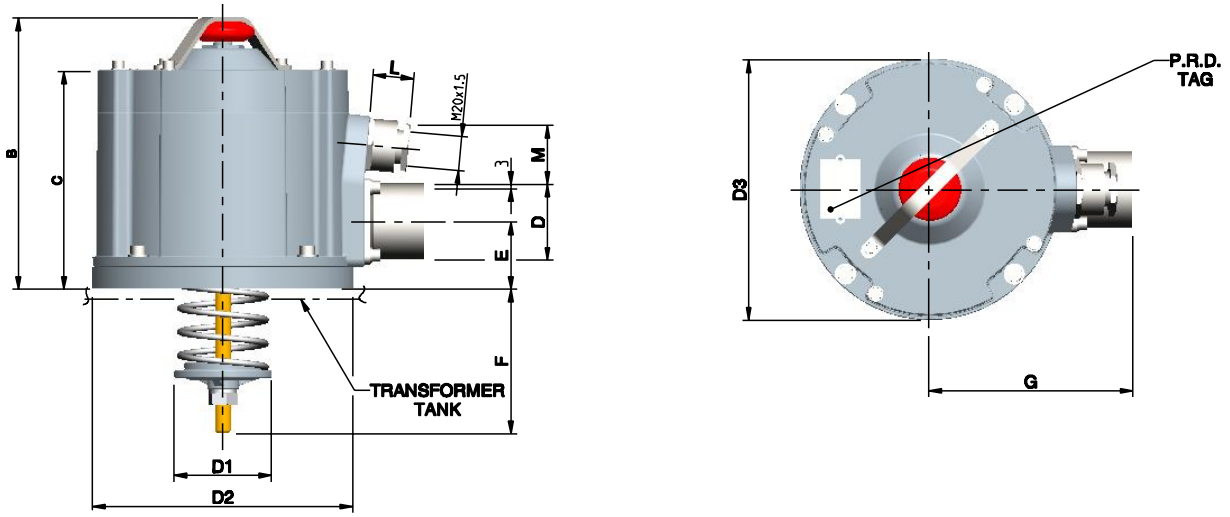
- THIRD SWITCH (terminals 32-34-31)
  change-over contact:
  – 34-31 normally open
  – 31-32 normally closed



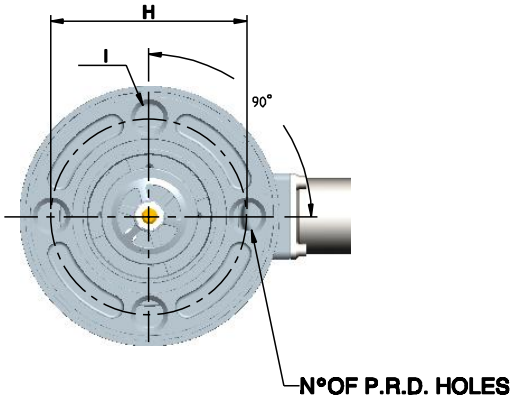
Pressure Relief Device - M

Overall dimensions

Type 50M



50M

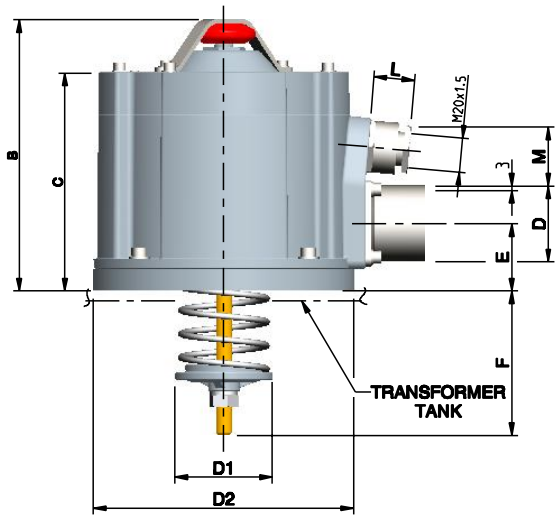


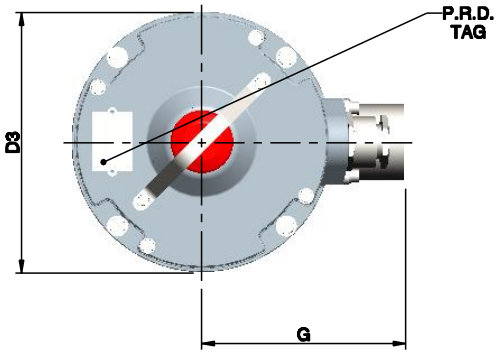
Type	B	C	D	D1	D2	D3	E	F20KPA *	F70KPA *	G	H	I	L	M	kg
50 M	170	139	Ø48.3	Ø62	Ø165	Ø166	41.5	95	60	130	Ø125	Ø18	23	38	2.1

* F = the dimension varies with set pressure

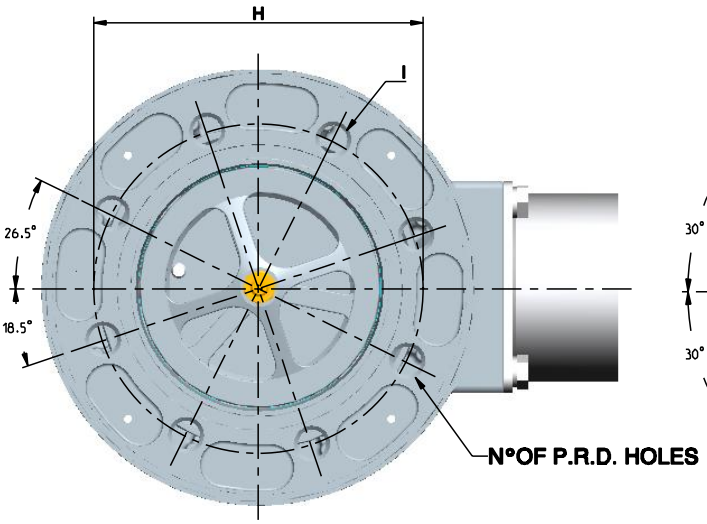
Overall dimensions

Type 125 M8 and 125 M6

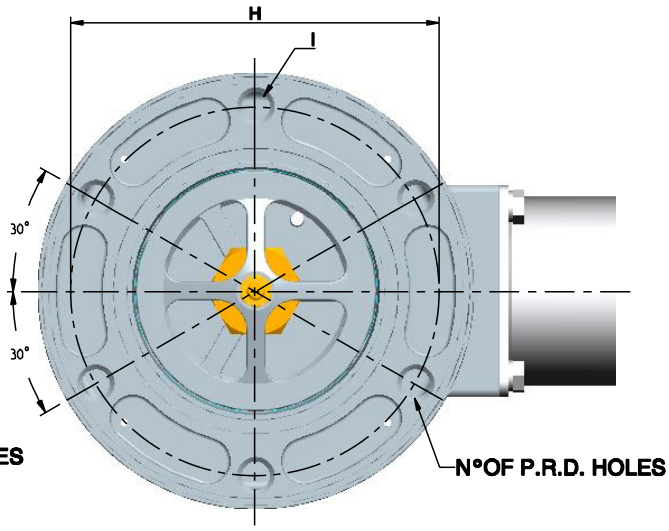




125M-8



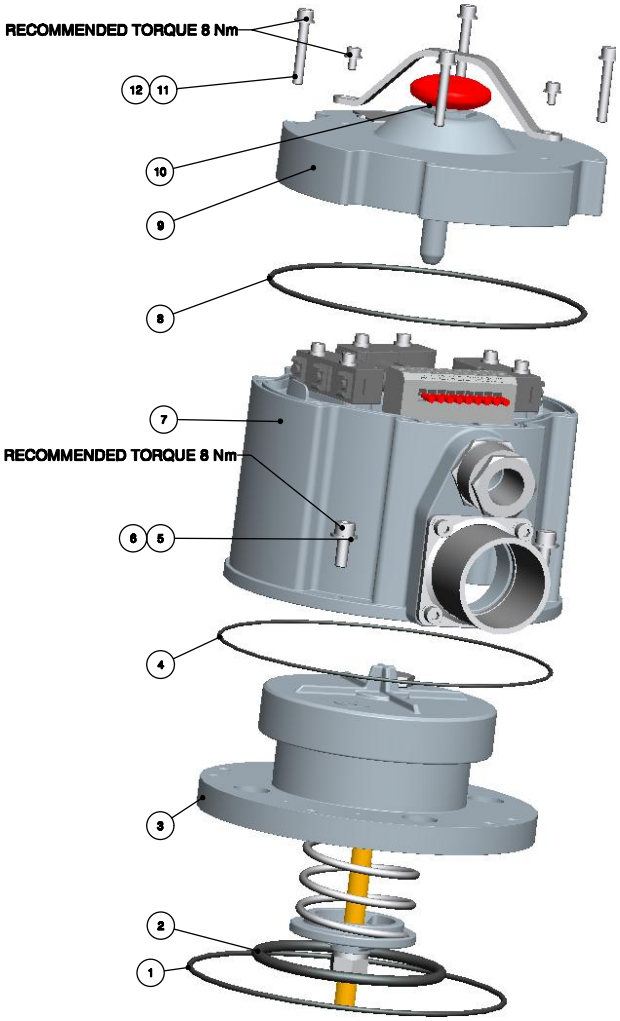
125M-6

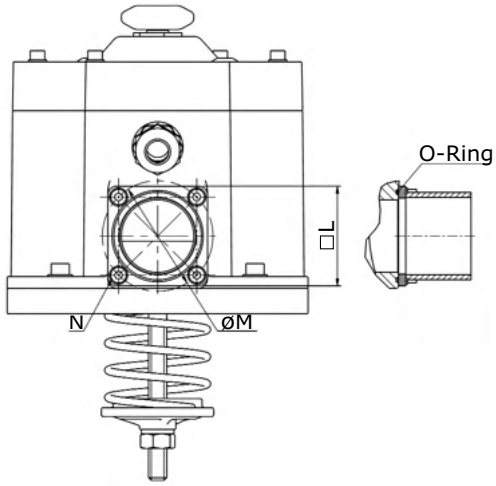


Type	B	C	D	D1	D2	D3	E	F20KPA	F70KPA	G	H	I	No. of holes
125 M-8	278	228	Ø120	Ø153	Ø278	Ø278	86	175	80	230	Ø210	Ø18	8
125 M-6	278	228	Ø120	Ø153	Ø278	Ø278	86	175	80	230	Ø235	Ø18	8

Pressure Relief Device - M

Assembling sequence





Type	□L	ØM	N	O-Ring
50 M	55	61	4 Screws M5x12	5G0D002187
125 M-8	135	152	4 Screws M12x25	5G0D004475
125 M-6	135	152	4 Screws M12x25	5G0D004475

Type 50 M

Ref.	Q.ty	Code	Description
1	1	5G0D003600*	GASKET O.R. 3600
2	1	5G0D000183*	GASKET O.R. 6337
3	1	-	50M SAFETY VALVE
4	1	5G0D002637	GASKET O.R. 2637
5	1	5V51106012	UNI 5931 M6X12 FIXING SCREW
6	1	5400800861	WASHER
7	1	-	OIL DUCT 50M
8	1	5G0D003600	GASKET O.R. 3600
9	1	-	OIL DUCT COVER 50M
10	1	-	VISUAL SIGNAL
11	1	5V50605035	UNI 5931 M5X35 FIXING SCREW
12	1	5RG0600050	WASHER

Type 125 M-8

Ref.	Q.ty	Code	Description
1	1	5G0D041050**	GASKET O.R. 41050
2	1	5G0L000227**	GASKET O.R. 8650
3	1	-	125M-8 SAFETY VALVE
4	1	5G0D041050**	GASKET O.R. 41050
5	1	5V50606060	UNI 5931 M6X60 FIXING SCREW
6	1	5400800861	WASHER
7	1	-	OIL DUCT 125M
8	1	5G0D041100	GASKET O.R. 41100
9	1	-	OIL DUCT COVER 125M
10	1	-	VISUAL SIGNAL
11	1	5V50605035	UNI 5931 M5X35 FIXING SCREW
12	1	5RG0600050	WASHER

Type 125 M-6

Ref.	Q.ty	Code	Description
1	1	5G0D041050**	GASKET O.R. 41050
2	1	5G0L000227**	GASKET O.R. 8650
3	1	-	125M-6 SAFETY VALVE
4	1	5G0D041050**	GASKET O.R. 41050
5	1	5V50606060	UNI 5931 M6X60 FIXING SCREW
6	1	5400800861	WASHER
7	1	-	OIL DUCT 125M
8	1	5G0D041100	GASKET O.R. 41100
9	1	-	OIL DUCT COVER 125M
10	1	-	VISUAL SIGNAL
11	1	5V50605035	UNI 5931 M5X35 FIXING SCREW
12	1	5RG0600050	WASHER

* ALTERNATIVE PLANE GASKET CODE 5C0V412501
** ALTERNATIVE PLANE GASKET CODE 5C0V452900

Order sheet

Number of pieces			
Model	50 M ☐	125 M-8 ☐	125 M-6 ☐
Contacts	**1** ☐	**2** ☐	**3** ☐
Pressure setting 20÷90 kPa Up to 200kPA for 50M only	Value ..... kPa		
For use in:	Moderate salinity areas acc. to ISO 12944 ☐		
	Off-shore areas acc. to ISO 12944 ☐		
Gaskets type	Viton ☐	silicone oils and/or high temperature -10°C up to + 150°C	
	NBR -40°C ☐	mineral oils and low temperature -40°C up to + 120°C	

SECTION 10

DEHYDRATING BREATHER:
ABB/COMEM SDB-14C

(INSTRUCTION MANUAL - 39 PAGES)
(ASSEMBLY INSTRUCTIONS - 3 PAGES)

APPENDIX D

INSTRUCTION MANUAL

Self-Dehydrating Breather Type “SDB”

CONTENTS

1. SAFETY

1.1 Safety instructions

Make sure that any personnel installing and operating the “self-dehydrating air breather”:

- Are technically qualified and competent
- Fully comply with these assembling instructions

Improper operations or misuse could cause danger to:

- Life and limb
- To the equipment and other assets of the operator
- To the proper function of the equipment

Safety instructions in this manual are shown in three different forms to emphasize important information.

WARNING

This information indicates particular danger to life and health. Disregarding such a warning can lead to serious or fatal injury.

CAUTION

This information indicates particular danger to equipment and/or other property of the user. Serious or fatal injury cannot be excluded.

NOTE

This note gives important and specific information concerning the equipment.

1.2 Specified applications

The dehydrating breather is used for oil-insulated transformer and on-load tap-changer to dry the air which is suctioned in by the oil conservator during the thermal contraction of the oil mass.

It is important to observe the limit values indicated on the nameplate and in the operating instruction before commissioning the device.

1.3 Safety notes on the equipment operation

Electrical installation is subject to the relevant national safety rules.
It is mandatory to connect the grounding cable.

CAUTION

During the regeneration phase, the surface temperature increases. Touching the surface is dangerous.

CAUTION

Installation, electrical connection and fitting the device may only be performed by qualified personnel and only in accordance with this instruction manual.
It is the responsibility of the user to ensure that the device is used for specified application only.
For safety reasons, please avoid any unauthorized and improper usage.

WARNING

All relevant fire protection regulations must be strictly followed.

2. SELF DEHYDRATING BREATHER TYPE “SDB”

2.1 Drawing

2.1.1 SDB-10C

The following are the external dimensions for the self-dehydrating air breather type SDB-10C:

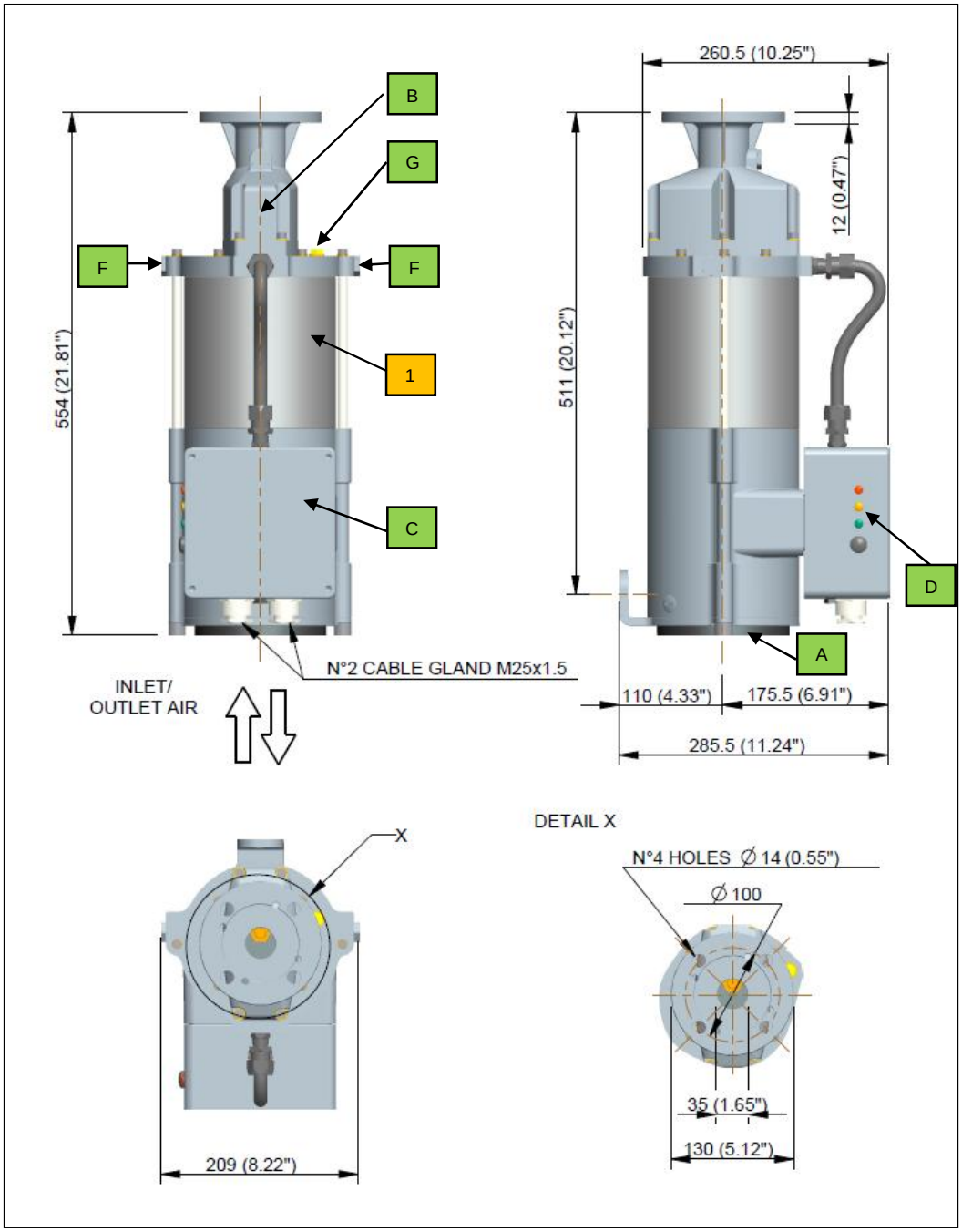


Fig. 1

2.1.2 SDB-10

The following are the external dimensions for the self-dehydrating air breather type SDB-10:

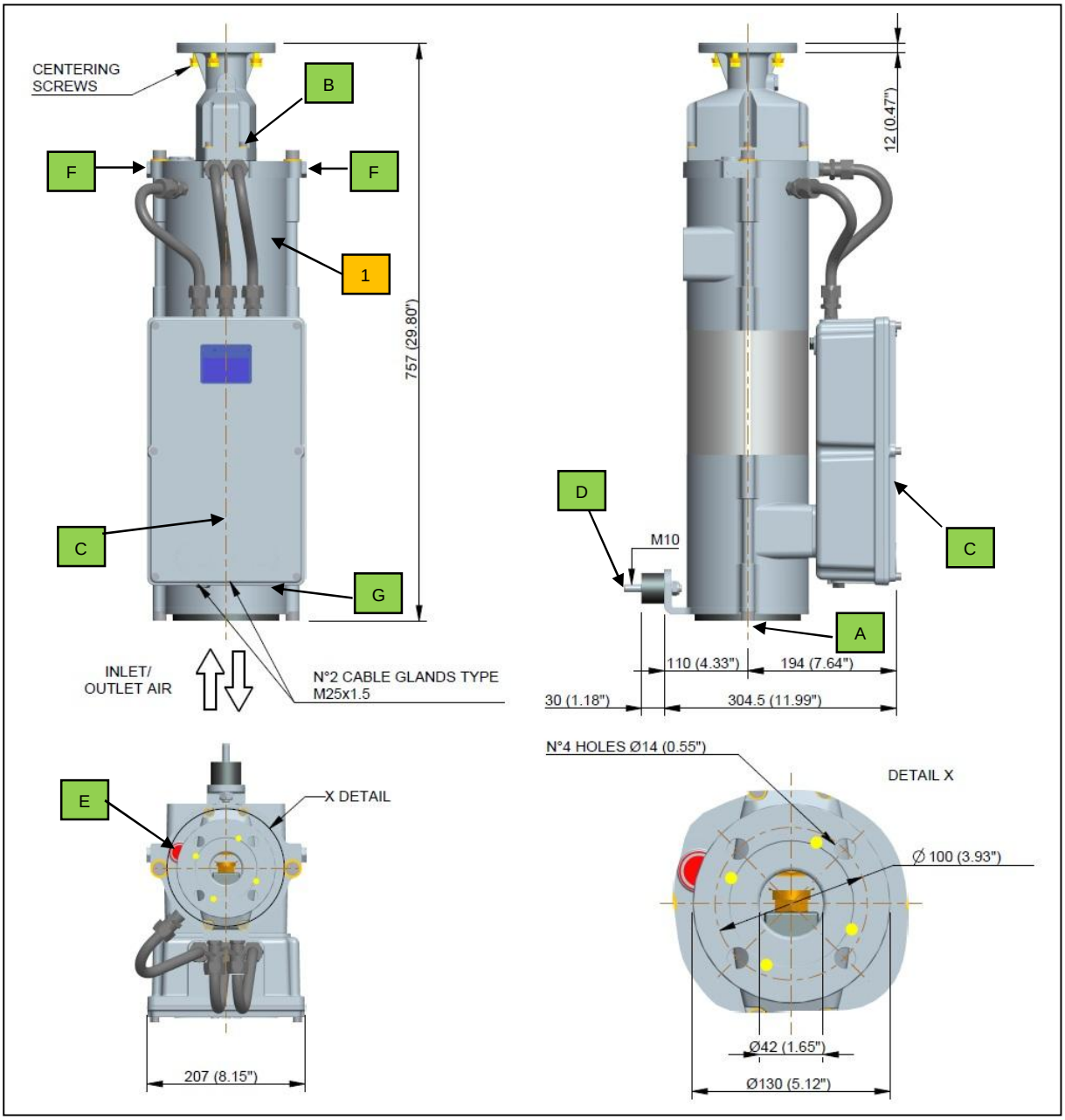


Fig. 2

2.1.3 SDB-12C/14C

The following are the external dimensions for the self-dehydrating air breather type SDB-12C/14C:

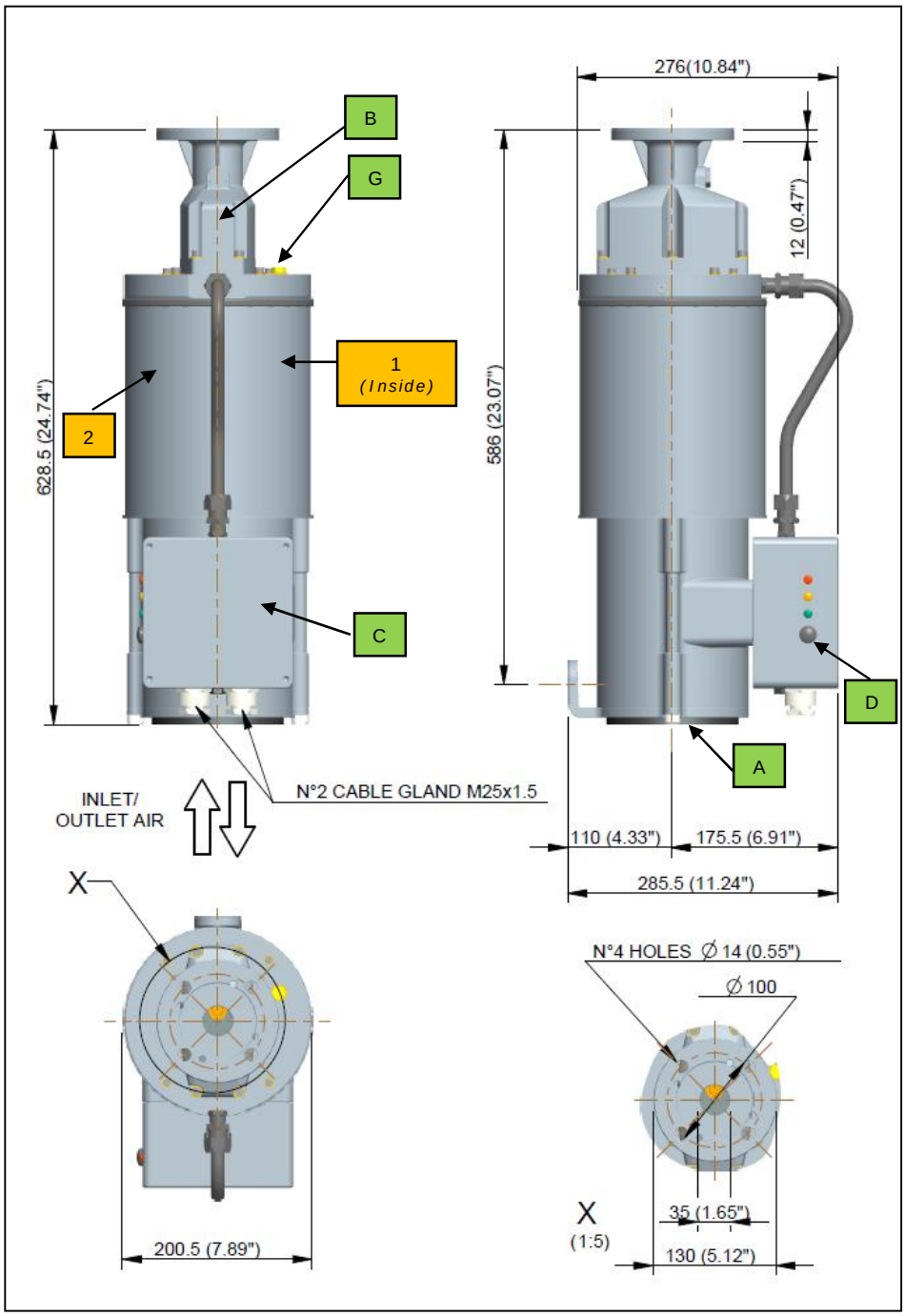


Fig. 3

2.1.4 SDB-15

The following are the external dimensions for the self-dehydrating air breather type SDB-15:

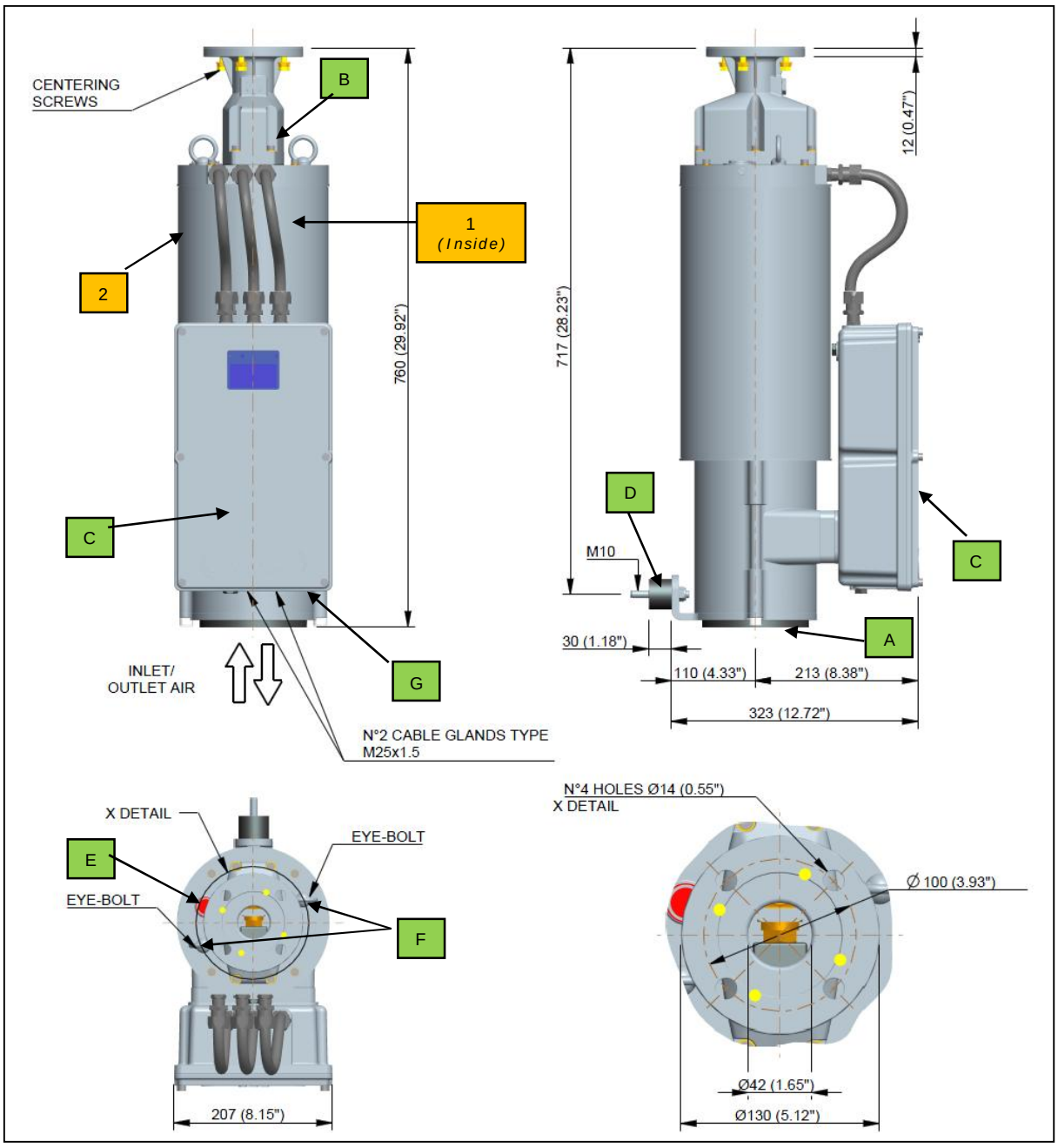


Fig. 4

2.1.5 SDB-30

The following are the external dimensions for the self-dehydrating air breather type SDB-30:

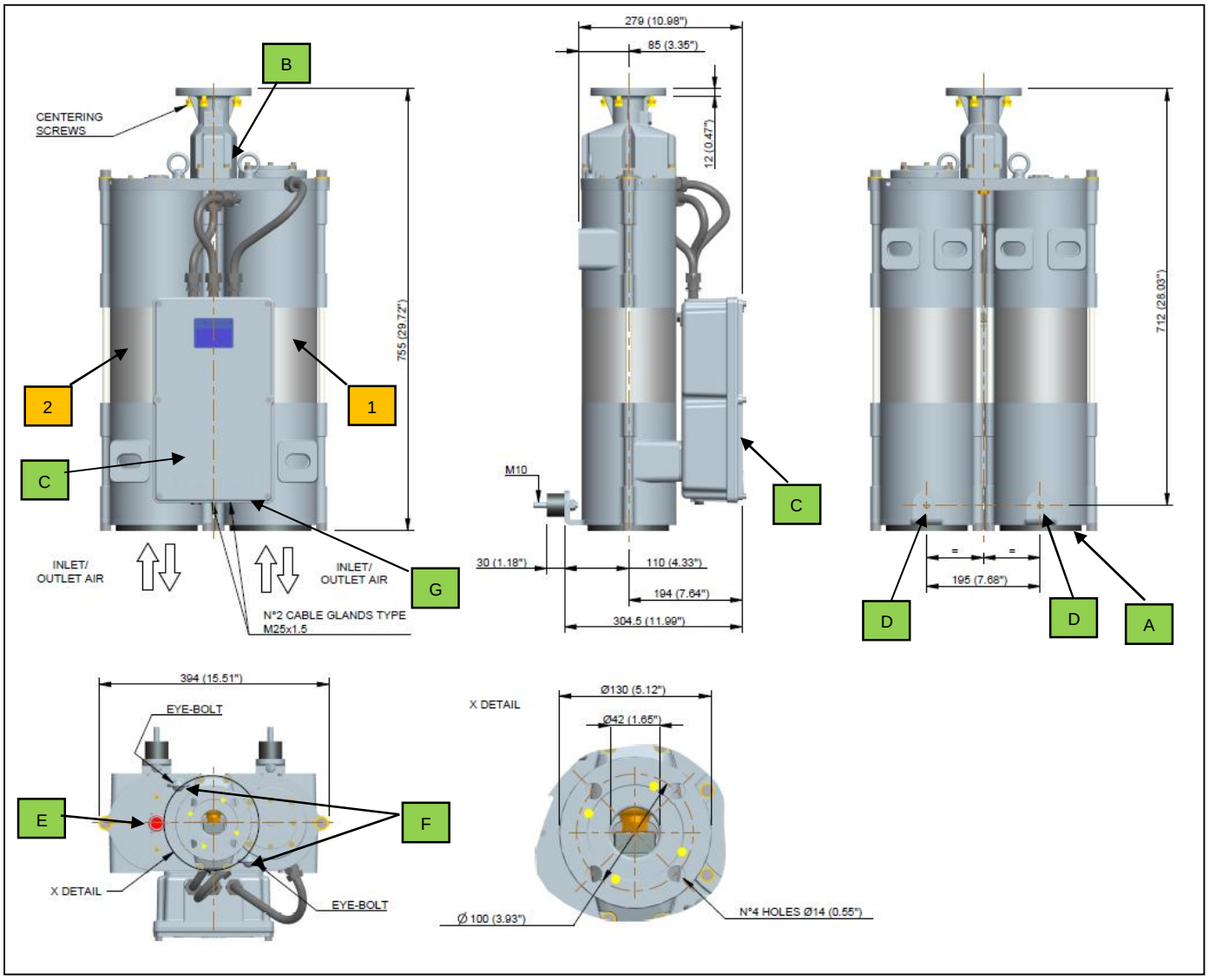


Fig. 5

2.2 Operating principle

2.2.1 SDB-10C

The self-dehydrating air breather works in accordance with the following principles.
During the normal operation the oil conservator intakes air that passes through the metallic filter (Fig.1/A). The metallic filter stops dust, sand and other particles from the contaminating air. The air then passes through the salt tank 1 (Fig.1/1). The salt tank is filled with silica gel that absorbs the moisture. The dehydrated air goes through piping to the oil conservator.

After a pre-determinate time (settable) a solenoid valve (upper part – fig.1/B) blocks the passage of air through salt tank 1 and deviates through the main self-dehydrating breather (Fig.6 --- SDB-14C, SDB-15 or SDB-30) by the pipe connected on one of the two plug (Fig.1/F). At the same time, a heating system inside tank 1 is activated. The water vapor leaving the silica gel is expelled outward by a fan that also dissipates the heat. Inside the salt, a probe controls the temperature of the heating element.
After the salt regeneration in tank 1 (timed regeneration), the solenoid valve is de-energized.

No maintenance is required for replacement and regeneration of the desiccant.

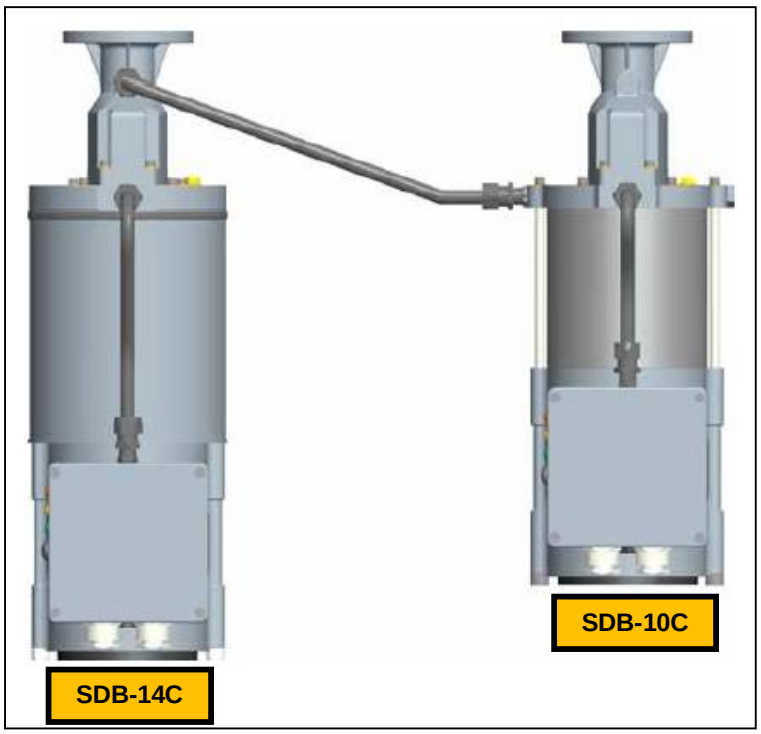


Fig. 6

2.2.2 SDB-12C & SDB-14C

The self-dehydrating air breather works in accordance with the following principles.
During the normal operation the oil conservator intakes air that passes through the metallic filter (Fig.3/A). The metallic filter stops dust, sand and other particles from the contaminating air. The air then passes through the salt tank 1 (Fig.3/1). The salt tank is filled with silica gel that absorbs the moisture. The dehydrated air goes through piping to the oil conservator.

After a pre-determinate time (settable) a solenoid valve (upper part – fig.3/B) blocks the passage of air through salt tank 1 and deviates through the “plenum chamber” 2 (Fig.3/2). At the same time, a heating system inside tank 1 is activated. The water vapor leaving the silica gel is expelled outward by a fan that also dissipates the heat.
Inside the salt, a probe controls the temperature of the heating element.
After the salt regeneration in tank 1 (timed regeneration), the solenoid valve is de-energized and the airflow through tank 2 is inhibited. The salt in this tank (2) is also dehydrated, regeneration of the salt in tank 2 follows automatically.

No maintenance is required for replacement and regeneration of the desiccant.

2.2.3 SDB-10

The self-dehydrating air breather works in accordance with the following principles.
During the normal operation the oil conservator intakes air that passes through the metallic filter (Fig.2/A). The metallic filter stops dust, sand and other particles from the contaminating air. The air then passes through the salt tank 1 (Fig.2/1). The salt tank is filled with silica gel that absorbs the moisture. The dehydrated air goes through piping to the oil conservator.

When the silica gel absorbs the moisture in the air, the weight of the salt increases and is constantly monitored by a weighing cell. When the weight increases and exceeds the pre-set value a solenoid valve (upper part – fig.2/B) blocks the passage of air through salt tank 1 and deviates through the main self-dehydrating breather (Fig.7 --- SDB-15 or SDB-30) by the pipe connected on one of the two plug (Fig.2/F). At the same time, a heating system inside tank 1 is activated. The water vapor leaving the silica gel is expelled outward by a fan that also dissipates the heat.
Inside the salt, a probe controls the temperature of the heating element.
During the functioning of the device, the weighing cell temperature is monitored by a temperature sensor mounted in the upper part.
After the salt regeneration in tank 1 (timed regeneration), the solenoid valve is de-energized.
No maintenance is required for replacement and regeneration of the desiccant.

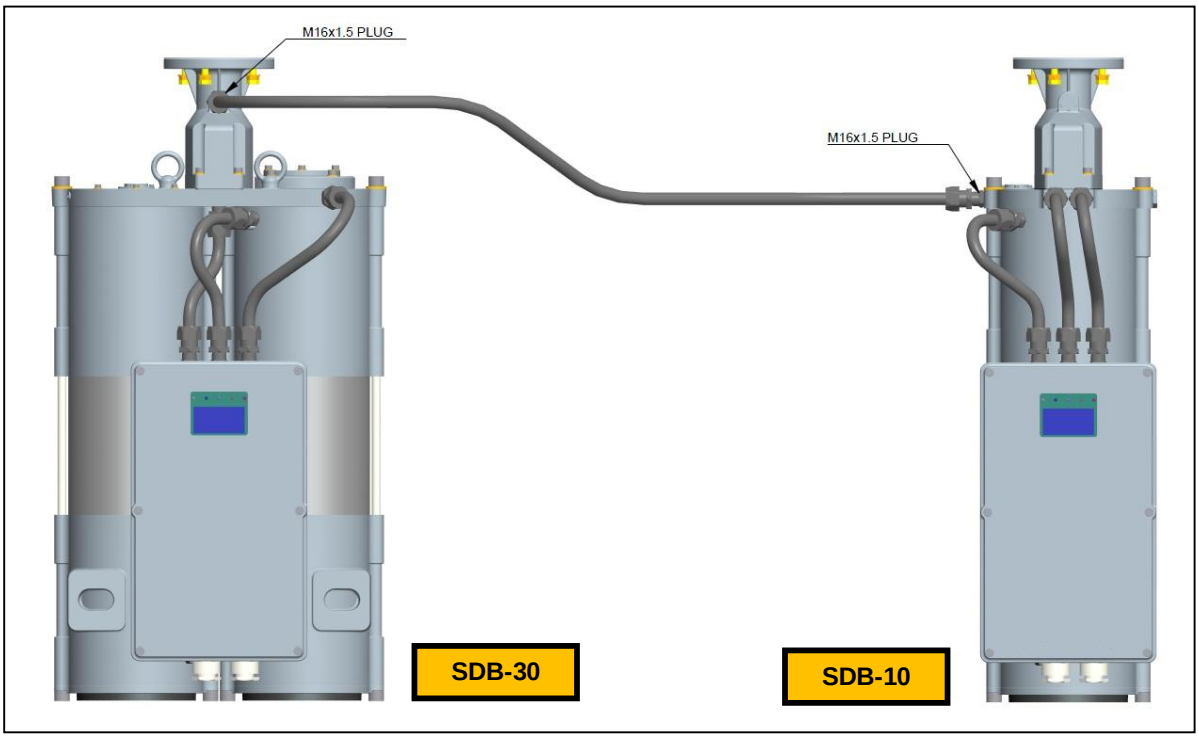


Fig. 7

2.2.4 SDB-15 & SDB-30

The self-dehydrating air breather works in accordance with the following principles.
During the normal operation the oil conservator intakes air that passes through the metallic filter (Fig.4-5/A). The metallic filter stops dust, sand and other particles from the contaminating air. The air then passes through the salt tank 1 (Fig.4-5/1). The salt tank is filled with silica gel that absorbs the moisture. The dehydrated air goes through piping to the oil conservator.

When the silica gel absorbs the moisture in the air, the weight of the salt increases and is constantly monitored by a weighing cell. When the weight increases and exceeds the pre-set value a solenoid valve (upper part – fig.4-5/B) blocks the passage of air through salt tank 1 and deviates through the “plenum chamber” 2 (Fig.4-5/2). At the same time, a heating system inside tank 1 is activated. The water vapor leaving the silica gel is expelled outward by a fan that also dissipates the heat.
Inside the salt, a probe controls the temperature of the heating element.
During the functioning of the device, the weighing cell temperature is monitored by a temperature sensor mounted in the upper part.
After the salt regeneration in tank 1 (timed regeneration), the solenoid valve is de-energized and the airflow through tank 2 is inhibited.
The salt in this tank (2) is also dehydrated, regeneration of the salt in tank 2 follows automatically.

No maintenance is required for replacement and regeneration of the desiccant.

2.3 System control

All the data coming from the instruments (heating elements, probes, fans, weighing cell and solenoid valve) are sent to an electronic control circuit.
For SDB-10/15/30, to avoid calibration problems of the weighing cell that can stop the device, a time control is also present which starts the backing process at a predetermined time.
The control unit and the terminals for the electrical connections are located in the terminal box (Fig.1-2-3-4-5/C).

2.4 Self-monitoring function

The self-dehydrating air breather has a self-monitoring function. When the device has got a failure, this is detected by contacts that can be set in accordance to customer demand on the following configuration:

STANDARD CONFIGURATION		SPECIAL CONFIGURATION	
Malfunction	What is detected	Malfunction	What is detected
POWER FAILURE	• Failure of the power supply • Failure of the electronic circuit	POWER FAILURE	• Failure of the power supply • Failure of the electronic circuit • Failure of the heating element • Failure of the weighing cell (SDB-10/15/30)
SYSTEM FAILURE	• Failure of the heating element • Failure of the weighing cell (SDB-10/15/30)		

Table 1

2.5 Outputs

		STANDARD CONFIGURATION	SPECIAL CONFIGURATION
STANDARD	RELAY	1 x change over contact: POWER FAILURE (terminals 22-24-21) 1 x change over contact: SYSTEM FAILURE (terminals 12-14-11)	1 x NC contact: POWER FAILURE (terminals 22-21) 1 x change over contact: HEATER ON (terminals 12-14-11)
	USB type B (SDB-10/15/30)	interface to download relevant device data	interface to download relevant device data
	RS-232 (SDB-10/15/30)	interface to set the main technical features of the circuit control	interface to set the main technical features of the circuit control
OPTIONS	ANALOG OUTPUT	4-20 mA (terminals 41-44) (Minimum / Maximum resistance: 100 / 470 Ohm)	4-20 mA (terminals 41-44) (Minimum / Maximum resistance: 100 / 470 Ohm)
	DIGITAL OUTPUT RS-485	Digital Signal (terminals 3-4))	Digital Signal (terminals 3-4))

Table 2

2.6 Status indicators

2.6.1 SDB-10C/12C/14C

Three LEDs which indicate the status of the device are installed outside the terminal box and observable by the external side (Fig.1/D and Fig.3/D).

Green LED (pulsating):	Power voltage ON
Yellow LED (pulsating):	Regenerating tank ON
Red LED (Fig.5/E):	Alarm

The display inside the box (Fig.8/A) shows information about the time between 2 regeneration process.

To set this time is necessary to push the button (Fig. 8/B) for 5 seconds until the number start to blink, after that, pushing the button is possible to increase the number of day (1 days steps, minimum value 1 days and maximum value 50 days)

After 5 second where the button is not pushed, the condition pass to idle.

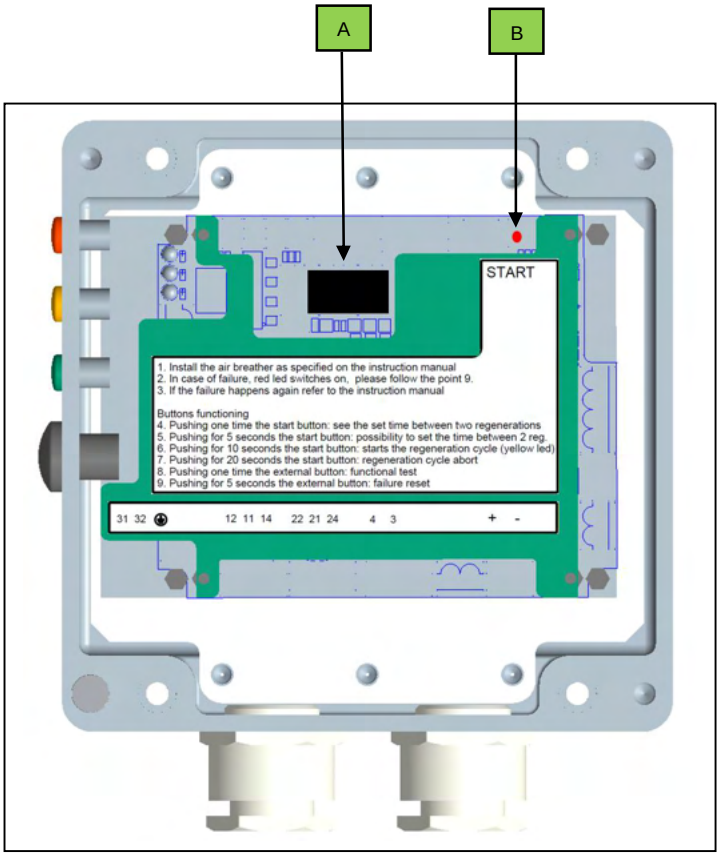


Fig. 8

NOTE

The time between 2 regenerations cycles could be set in accordance with the table in appendix A4 (as default it is fixed at 15 days)

2.6.2 SDB-10/15/30

Five LEDs which indicate the status of the device are installed inside the terminal box and observable through the glass.

Green LED (Fig.9/A):	Power voltage ON
Yellow LED (Fig.9/B):	Regenerating tank 1
Yellow LED (Fig.9/C):	Regenerating tank 2
Blue LED (Fig. 9/D):	ON: tank 2 in operation (for SDB-10: SDB-15/30 connected in operation) OFF: tank 1 in operation
Red LED (Fig.9/E):	Alarm

The display (Fig.9/F) shows information that is normally displayed as:

State (Fig.10/B):

- IDLE: normal functioning
- WARM UP CYL: heating tank 1 or 2
- DRYING CYL: maintenance at high temperatures in the tank (1 or 2) during the regeneration phase
- COOL DOWN CYL: after the dehydrating phase

Salt Saturation (Fig.10/A): Salt condition:

- 0%: completely dry
- 100%: saturation condition

Alarm warning: an alarm warning is displayed on the screen when a failure occurs (see chapter 5.3). The warnings are:

- WARNING: FAN 1 FAIL and FAN 2 FAIL (only for SDB-030)
- HEATER 1 FALL
- HEATER 2 FALL
- TANK 1 NOT DRYED
- SALTS REPLACEMENT

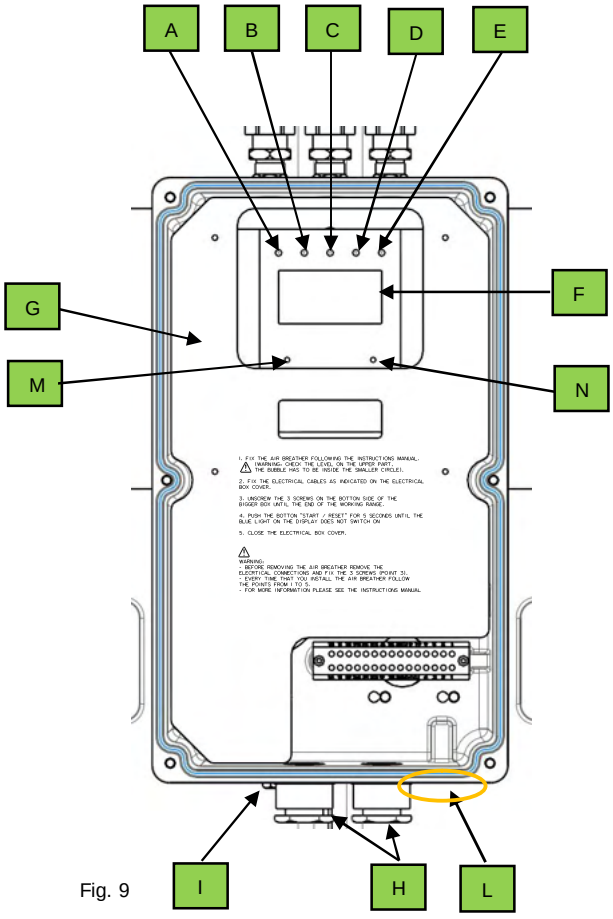


Fig. 9

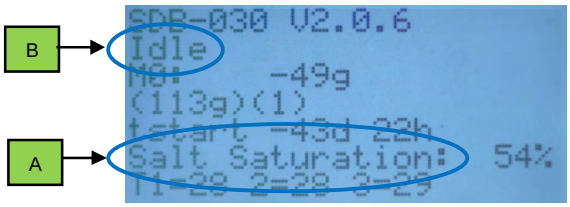


Fig. 10

2.7 Technical features

Standard connection flange	DN40 flange in accordance with standard UNI EN 1092-1:2003					
Material	All the external part are resistant to transformer oils, salt fog and UV rays **					
Color	RAL 9002 **					
Ambient temperature	-40 to 80°C / -40 to 176°F ***					
Degree of protection	IP45 in accordance with EN60529 (except terminal box which is IP65)					
Vibration damping	Optional anti-vibration supports can be anchored to the transformer (Fig.3/D,4/D)					
Functional test	Available (Push and hold the stand-by button for 10 seconds (see chapter 5.2)					
	SDB-10C	SDB-10	SDB-12C	SDB-14C	SDB-15	SDB-30
Weight	12Kg/26.5lb	22Kg/48.5lb	18Kg/39.6lb	18Kg/39.6lb	28Kg/61.7lb	37Kg/81.6lb
Salt weight (main tank)	2.0Kg/4.4lb	2.0Kg/4.4lb	2.0Kg/4.4lb	2.0Kg/4.4lb	2.5Kg/5.5lb	3.0Kg/6.6lb
Maximum oil volume	45 m^3, 40 tons oil, 12,000 gals				90 m^3, 80 tons oil, 24,000 gals	
Power Panel						
Degree of protection of terminal board	IP 65 according to EN 60259					
Ventilation valve	To prevent the formation of condensation (Fig.6/I, 9/I)					
Cable gland	Two M25x1.5 (Fig.6/H, 9/H)					
Wires	4 mm^2, AWG 24-10 flexible cables with or without terminals (screws are used to fasten the cables to the terminal board on the terminal box). For digital/analog output advised 4x1mm^2 (4x0.00155"^{2})/ 2x1mm^2 (2x0.0155"^{2}) shielded twisted pair cable.					
Power Supply						
Supply voltage	115/230 VAC/DC ±10% 50/60 Hz					
Current consumption	Max 100 mA					
Current consumption (during regeneration process)	3.0 A					
Heating element insulation	2.0 kV 50/60 Hz, 1 min, power terminals – ground – ground					
Braking capacity (relays on the electronic card)	Voltage		Current		Braking capacity	
	230V AC		2A		500 VA	cosø >0,5
	30/110/220V DC		10/03/0,12 A			L/R<40 ms
Analog output (optional)	**(See chapter 2.5)**					
Signal output	4-20 mA SDB-15/30: proportional to silica gel saturation level (0% - 4mA …… 100% - 20mA) SDB-10C/12C/14C: proportional to tank 1 temperature					
Max distance for analogical output	Max 30 m / 98 ft (for different demands contact COMEM)					
Digital output (optional)	**(See chapter 2.5)**					
Digital output	Serial RS485 (for more information contact COMEM assistance dept.)					
Distance for digital output	Max 30 m / 98 ft (for different demands contact COMEM)					
Signal contacts	**(See chapter 2.5)**					
Dielectric strength of contacts (short duration power frequency withstand voltage 1 min)	Between contacts and ground: 2kV					
	Between contacts in open position: 1kV					

** *For critical environmental conditions please contact Comem*
*** *Below -20°C/-4°F the inscriptions on the display disappear until the temperature reaches over -20°C/-4°F again.*

Table 3

2.8 Test

Description:	Relevant Standard:	Description:	Relevant Standard:
Fast transient/burs immunity test	IEC 61 000-4-4	Voltage fluctuations and flicker	EN 61000-3-3
Conducted disturbances	IEC 61 000-4-6	Protection grade (IP 65 for terminal box)	CEI EN 60259
Electrostatic discharge	IEC 61 000-4-2	Protection grade (IP 45 for completely device)	CEI EN 60259
Supply variation	IEC 61 000-4-11	Low temperature	IEC 60068-2-1
Surge immunity test	IEC 61 000-4-5	Dry heat	IEC 60068-2-2
Magnetic field immunity test	IEC 61 000-4-3	Damp heat, cyclic	IEC 60068-2-30
Immunity test	IEC 61 000-6-2	Damp heat, constant	IEC 60068-2-78
Emission standard	IEC 61 000-6-4 (EN 55022)	Oscillation test , shock test	IEC 60068-2-27
Power-frequency magnetic field	EN61000-4-8	Stationary vibration, sinusoidal (cl.4M4)	EN 60721-3-4
Harmonic current emission	EN 61000-3-2	Seismic vibration (class 0, level II)	EN 60068-3-3

Table 3

2.9 Applications

	SDB type	Power consumption*	Silicagel**
Tap Changers	SDB-10C/10	350W	2 kg
	SDB-12C	350W	2 kg
Network transformer <40MVA	SDB-14C	350W	2 kg
Network transformer >40MVA <200MVA	SDB-15	600 W	2.5 Kg
Network transformer >200MVA	SDB-30	600 W	3 kg
Shunt reactors >40Mvar <200Mvar	SDB-15	600W	2.5 Kg
Shunt reactors >200Mvar	SDB-30	600 W	3 kg
HVDC transformers	SDB-30	600 W	3 kg
Furnace transformers	SDB-30	600 W	3 kg
GSU transformers	2xSDB-30	1200W	6 kg

** during the heating procedure*
*** main tank*

Table 4

NOTE

For each application, in case of the quantity of oil exceed the max value for each breather, Comem advice to put 2 SDB in parallel.

3. Installation

CAUTION

The operating and installation requirements described in this manual must be strictly followed. If not, the device can be damaged or a malfunction may occur.

The unit must be mounted level and upright.

The unit and piping must be installed so the oil is not able to enter the breather.

Do not install in an enclosed cabinet; proper ventilation is required.

3.1 SDB-10C

First step: Remove the tape from the entry/exit air zones. Fix the upper flange (Fig.11/A) on the flange of the pipe from the conservator (Fig.11/B) with four M12 screws (Fig.11/C).

CAUTION

Put the plane gasket between the two flanges.

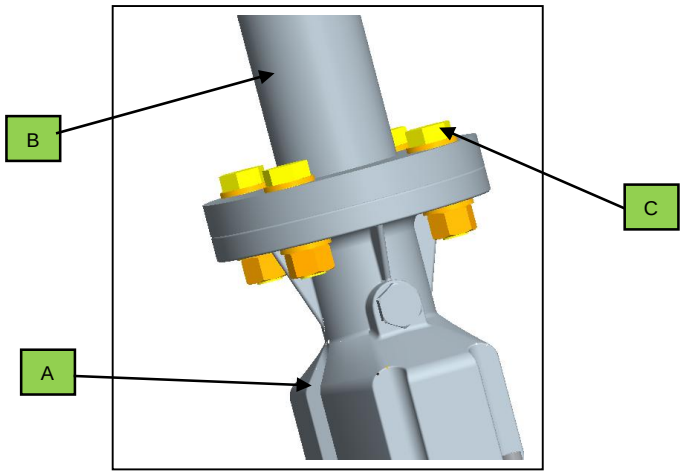


Fig. 11

Second step: unscrew plug on the SDB-10. Depending on the position of the main air breather (SDB-14C/15 or SDB-30) unscrew the right plug (Fig.12/A) or left plug (Fig.12/B).
Unscrew the plug on the main air breather (Fig.13/A).

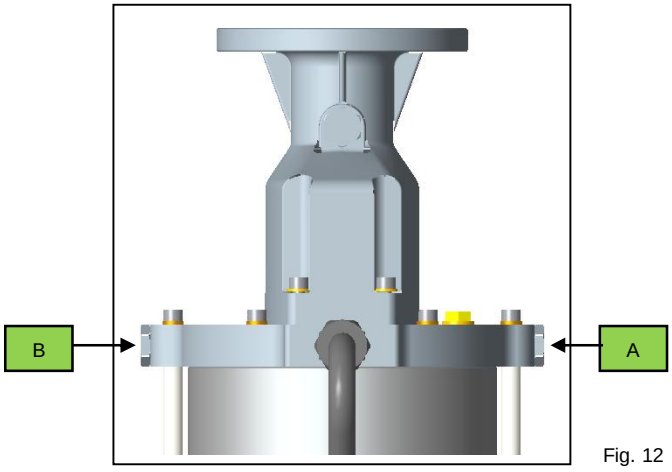


Fig. 12

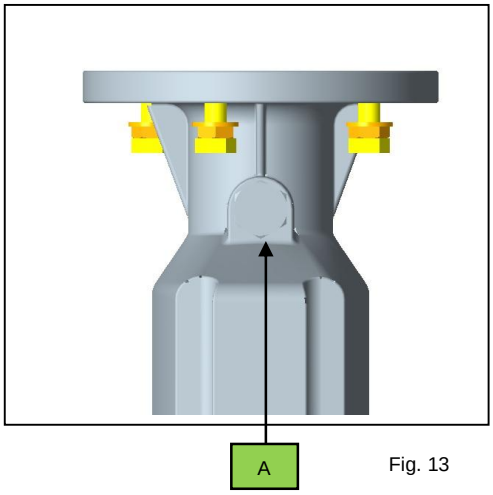


Fig. 13

Connect a pipe between the two plugs (Fig.14). The plug thread is M16x1.5 (For detail see the Appendix A5)

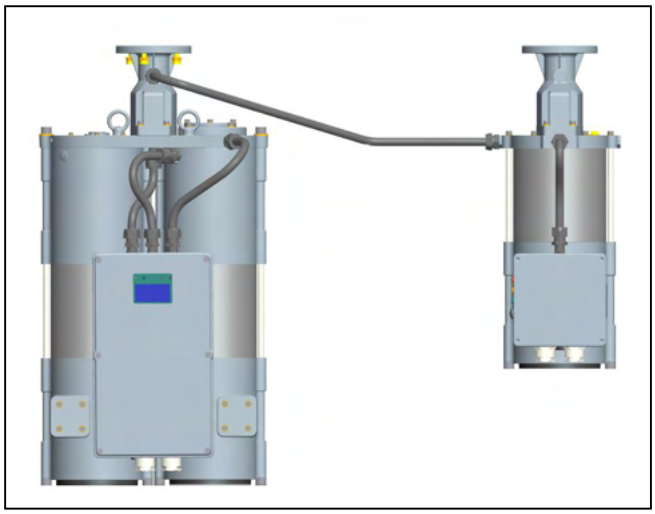


Fig. 14

WARNING

Between the plug and the housing must be positioned an OR gasket to avoid any leakage.
The system (pipe and plug) must be assembled to guarantee the sealing.

NOTE

According to the transformer design, COMEM can supply the plugs and the pipe.

3.2 SDB-10

First step: Remove the tape from the entry/exit air zones. Fix the upper flange (Fig.15/A) on the flange of the pipe from the conservator (Fig.15/B) with four M12 screws (Fig.15/C).

CAUTION

Put the plane gasket between the two flanges.

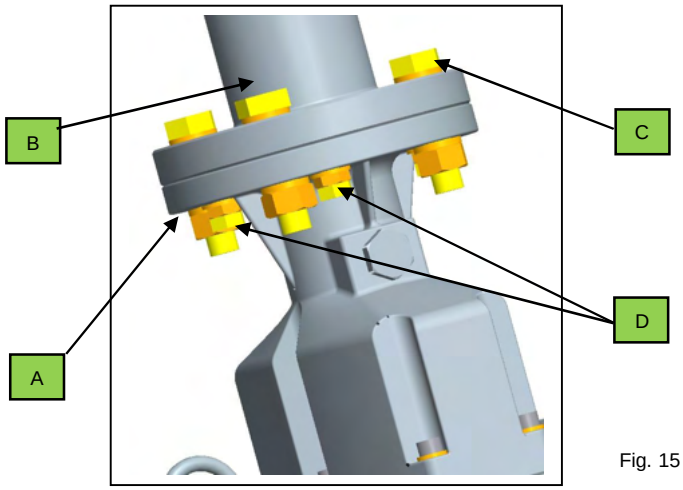


Fig. 15

Second step: Check the upper level (Fig.2/E), the internal bubble must be inside the smallest black ring.
Readjust the four special screws (Fig.15/D) to find the right position following the scheme:

- Move the vertical axis to the right (black arrow – Fig.17) and unscrew the screws 1-2-3 and fix the M12 screw until the end of the working range (Fig.17).

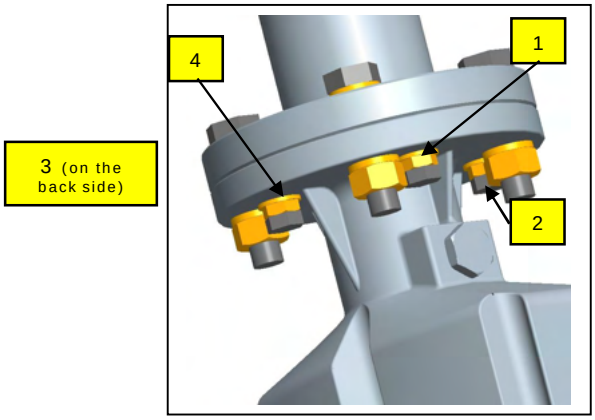


Fig. 16

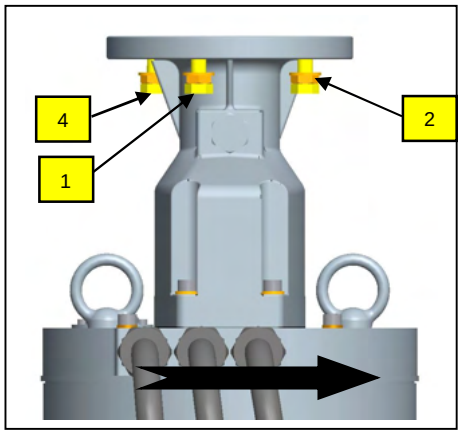


Fig. 17

- Move the vertical axis to the left (black arrow – Fig.16) and unscrew the screws 1-4-3 and fix the M12 screw until the end of the working range.

- Move the vertical axis toward (white arrow – Fig.19) and unscrew the screws 1-2-4 and fix the M12 screw until the end of the working range

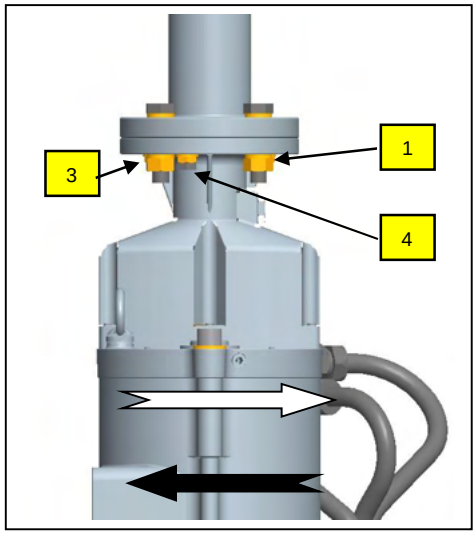


Fig. 19

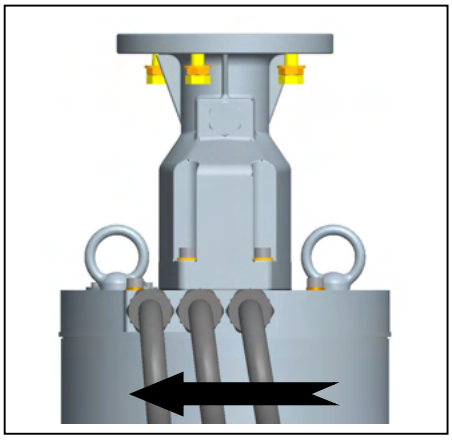


Fig. 18

- Move the vertical axis back (black arrow – Fig.19) and unscrew the special screws 4-2-3 and fix the M12 screw until the end of the working range.

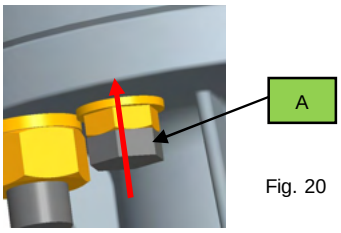


Fig. 20

At the end verify the upper level (Fig.2/E). If the internal bubble is inside the smallest black ring fix the four nuts against the flange (Fig.20/A) to avoid to unscrewing of the screws and to miss the correct position of the air dehydrating breather.

Third step: unscrew the bottom screw in the lower part of the device (Fig.21/A) until the end of the screws working range.

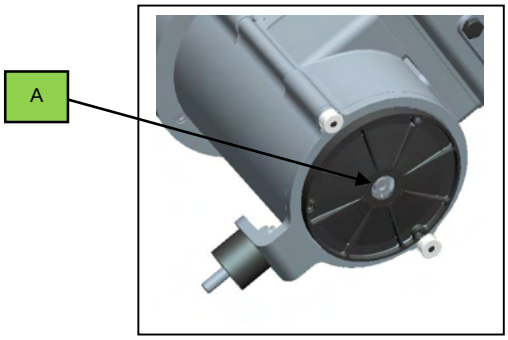


Fig. 21

Fig. 22

NOTE

The transformer manufacturer can choose whether to apply the anti-vibration kit which is supplied with the SDB depending on the sturdiness of the support (Fig.22/A).

For the electrical connections COMEM advise to use armed cables.

Fourth step: unscrew plug on the SDB-10. Depending on the position of the main air breather (SDB-15 or SDB-30) unscrew the right plug (Fig.23/A) or left plug (Fig.23/B).
Unscrew the plug on the main air breather (Fig.24/A).

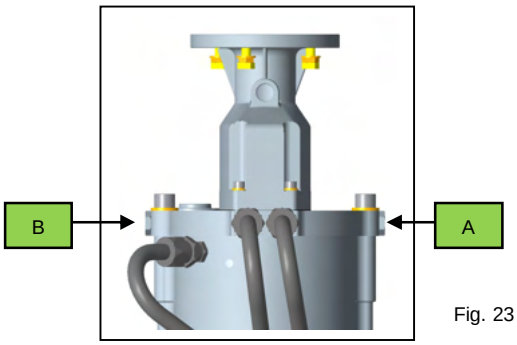


Fig. 23

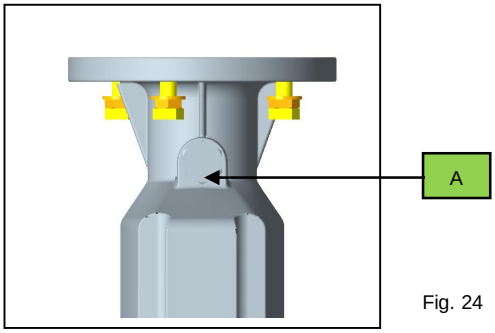


Fig. 24

Connect a pipe between the two plugs (Fig.25). The plug thread is M16x1.5 (For detail see the Appendix A5).

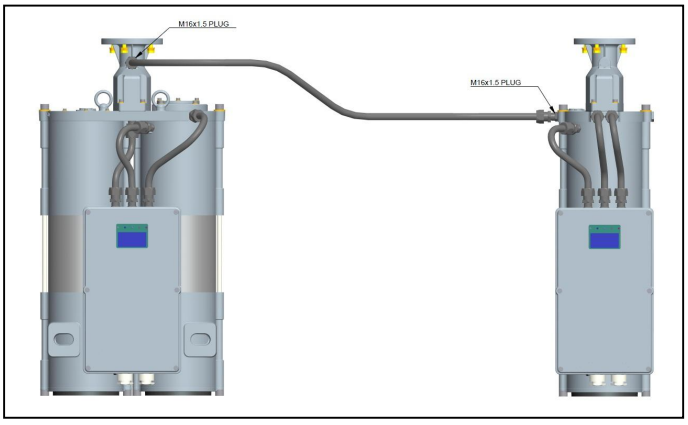


Fig. 25

WARNING

Between the plug and the housing must be positioned an OR gasket to avoid any leakage.
The system (pipe and plug) must be assembled to guarantee the sealing.

NOTE

According to the transformer design, COMEM can supply the plugs and the pipe.

3.3 SDB-12C/14C

First step: Remove the tape from the entry/exit air zones. Fix the upper flange (Fig.26/A) on the flange of the pipe from the conservator (Fig.26/B) with four M12 screws (Fig.26/C).

CAUTION

Put the plane gasket between the two flanges.

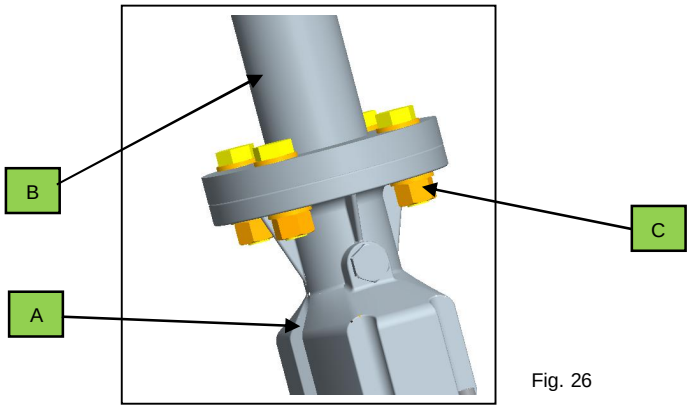


Fig. 26

3.4 SDB-15/30

First step: Remove the tape from the entry/exit air zones. Fix the upper flange (Fig.27/A) on the flange of the pipe from the conservator (Fig.27/B) with four M12 screws (Fig.27/C).

CAUTION

Put the plane gasket between the two flanges.

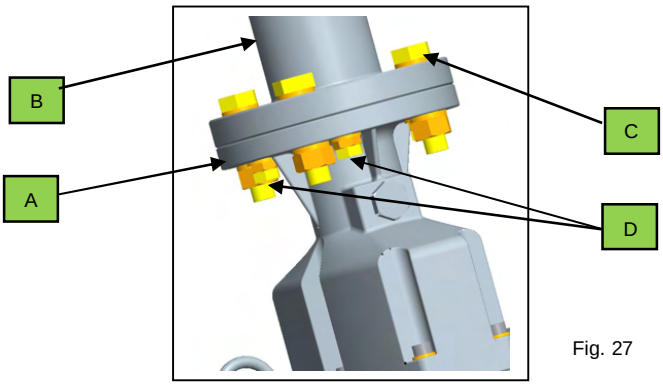


Fig. 27

Second step: Check the upper level (Fig.4/E – 5/E), the internal bubble must be inside the smallest black ring.
Readjust the four special screws (Fig.27/D) to find the right position following the scheme:

- Move the vertical axis to the right (black arrow – Fig.29) and unscrew the screws 1-2-3 and fix the M12 screw until the end of the working range (Fig.29).

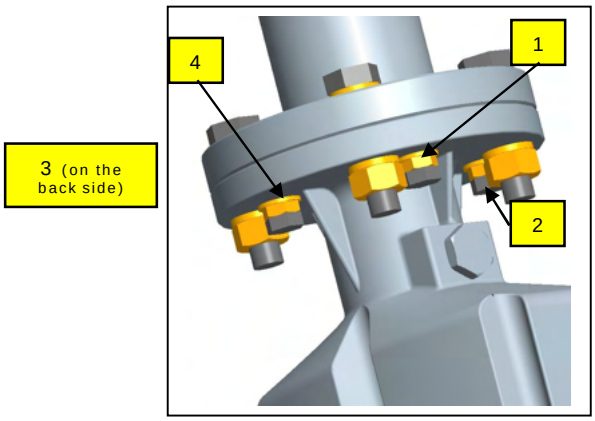


Fig. 28

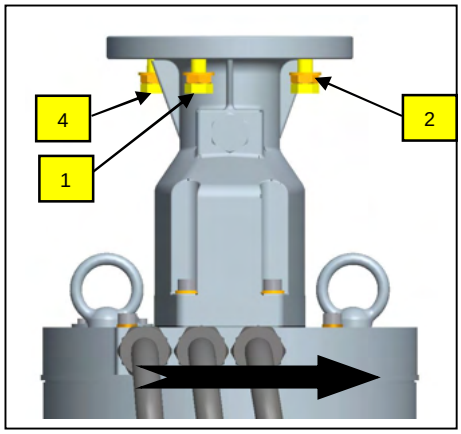


Fig. 29

- Move the vertical axis to the left (black arrow – Fig.30) and unscrew the screws 1-4-3 and fix the M12 screw until the end of the working range.

- Move the vertical axis toward (white arrow – Fig.31) and unscrew the screws 1-2-4 and fix the M12 screw until the end of the working range

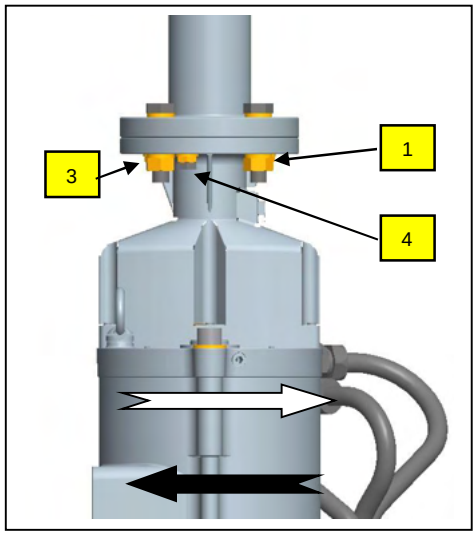


Fig. 31

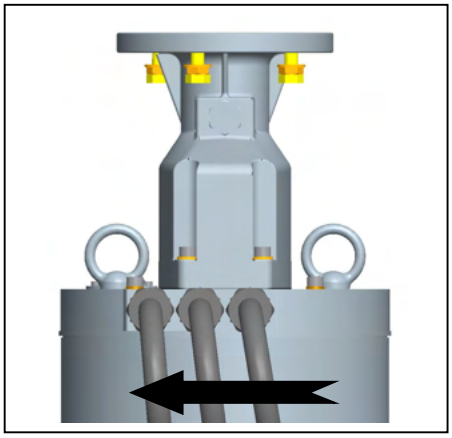


Fig. 30

- Move the vertical axis back (black arrow – Fig.31) and unscrew the special screws 4-2-3 and fix the M12 screw until the end of the working range.

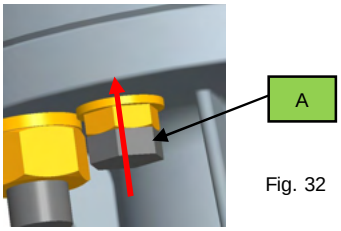


Fig. 32

At the end verify the upper level (Fig.4/E, 5/E). If the internal bubble is inside the smallest black ring fix the four nuts against the flange (Fig.32/A) to avoid to unscrewing of the screws and to miss the correct position of the air dehydrating breather.

Third step: unscrew the bottom screw in the lower part of the device (Fig.33/A) until the end of the screws working range.

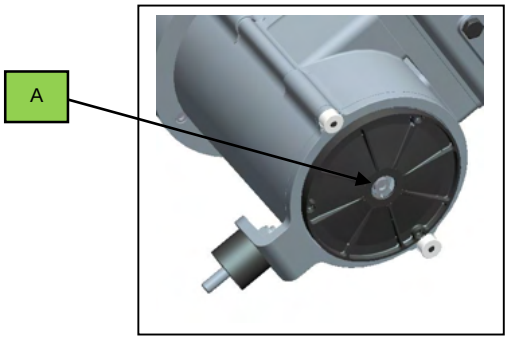


Fig. 33

NOTE

The transformer manufacturer can choose whether to apply the anti-vibration kit which is supplied with the SDB depending on the sturdiness of the support (Fig.34/A).

For the electrical connections COMEM advise to use armed cables.

Fig.34

4. Connection

CAUTION

Electrical connections should only be performed by qualified and skilled personnel trained in the applicable health and safety regulations of the relevant country.

WARNING

Dangerous electrical voltages!
It is imperative to deactivate the power supply during wiring of the device.

CAUTION

During the terminal box assembly, use caution not to damage the OR gasket. If this occurs it must be substituted.

To wire the dehydrating breather, open the terminal box (Fig.1-2-3-4-5/C). An external ground screw is positioned under the electrical box (Fig. 2-4-5/G) for SDB-10/15/30 and on the upper flange (Fig. 1-3/G) for SDB-10C/12C/14C.

4.1 Power voltage

First, connect protective ground externally (Fig.1-2-3-4-5/G).
Connect the power voltage (as written on the label on the terminal box cover) to terminals 31- 32.
For the SDB-10C/12C/14C remove the fast plug-in pulling the wire (Fig.35/A), connect the supply voltage wires in accordance to the label electrical scheme (Fig.36) and connect again the plug-in (Fig.37).

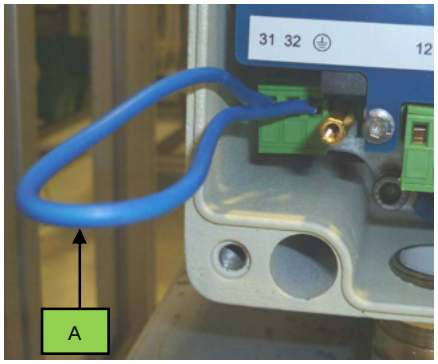


Fig.35

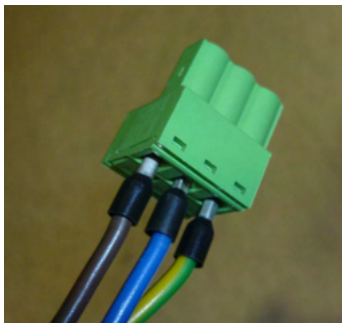


Fig.36

Fig.37

Fig.3

4.2 Relay

4.2.1 Standard Configuration

There are 2 contact failures (See chapter 2.5):

- 1 x change over contact: POWER FAILURE (terminal 22-24-21)
  NO contact: terminals 24-21
  NC contact: terminals 21-22

  After supply voltage:
  NC contact: terminals 24-21
  NO contact: terminals 21-22

- 1 x change over contact: SYSTEM FAILURE (terminal 12-14-11)
  NO contact: terminals 14-11
  NC contact: terminals 11-12

4.2.2 Special Configuration

There is one-contact failures (See chapter 2.5):

- 1 x NC contact: POWER FAILURE (terminal 22-21)
  NC contact: terminals 21-22

  After supply voltage:
  NO contact: terminals 21-22

- 1 x change over contact: HEATER ON (terminal 12-14-11)
  NO contact: terminals 14-11
  NC contact: terminals 11-12

CAUTION

The alarm relays (contact failure) will not trip the transformer.

4.3 Analog Output (optional)

Terminals for analog output 4-20 mA: 41-44

4.4 Digital Output (optional)

Digital output RS485: terminals 3-4

CAUTION

Close the free cable gland with a plug or gasket if both cable glands are not used.

5. Operation and maintenance

5.1 Operation

- **SDB-10/15/30 (MANDATORY):** after the installation and connection, the device has to be calibrated. After the connection of the power supply, the device goes in stand-by for one hour. During this time, the weight is not measured.
  To insure that the salt is not damaged during transport, one complete cycle has to be performed.

  The operator has to push the START/RESET button (Fig.9/M) on the terminal box for approximately five seconds until the blue light (Fig.9/D) switches on. The entire regeneration cycle takes about twenty hours.

- **SDB-10C/12C/14C:** set the time (days) between two-regeneration processes in accordance to appendix A4 (default value: 15 days).
  In case of necessity, it is possible to force a regeneration cycle pushing for 10 seconds the START internal button(Fig.8/B).

5.2 Regeneration cycle sequence:

SDB-10C	SDB-12C/14C	SDB-10	SDB-15/30
- Warm Up cyl1 - dehydrate cyl1 - cooling cyl1	- Warm Up cyl1 - dehydrate cyl1 - cooling cyl1 - warm up cyl2 - dehydrate cyl2 - cooling cyl2	- Warm Up cyl1 - dehydrate cyl1 - cooling cyl1 - calibration	- Warm Up cyl1 - dehydrate cyl1 - cooling cyl1 - warm up cyl2 - dehydrate cyl2 - cooling cyl2 - calibration

Table 5

CAUTION

The total regeneration phase takes about 20 hours.
In order to stop the regeneration cycle, push and hold both button (START/ RESET) (Fig.9/M – 8/B) for 20 seconds (for the SDB-10/15/30 the correct calibration of the load cell is not guaranteed if this is performed).

NOTE

Comem advices to disconnect the SDB during the electrical transformer routine test

5.3 Maintenance

During regular maintenance on the transformer, we recommend performing the following checks on the dehydrating breather:

- Check the exterior condition of the device (especially the filter air Fig.1-2-3-4-5/A)
- Check the LED indication
- Check the display indication (SDB-10/15/30)
- Check the failure contact
- Check the upper level (Fig.2-4-5/E, SDB-10/15/30), the internal bubble must be inside the smallest black ring
- It is possible, to perform a functional test pushing
  - SDB-10/15/30: 10 seconds the stand-by button (Fig.7/N)
  - SDB-10C/12C/14: external button (Fig.1-3/D)

CAUTION

SDB-10/15/30: if the device is not level, proceed as explained in section 3.2/3.4 (first step) and after, if the condition of the device is on IDLE, start the regeneration cycle as explained in section 5.1.

NOTE

If the fitting is not powered for more than 3 days, the clock will re-start at the next powering from the date and hour of the end of the last regeneration cycle.

NOTE

It is not possible to do the functional test if the regeneration process is activated.

5.3 Fault monitoring

The device has a self-monitoring function to detect internal faults, which are displayed by LEDs and failure contacts. Adding information can be done by the display on the SDB-10/15/30.
The following table lists the individual faults.

FAULT	LED Indication	ERROR-RELAY (STANDARD CONFIGURATION)	ERROR-RELAY (SPECIAL CONFIGURATION)	DISPLAY Indication (SDB-10/15/30)	NOTE
Failure of the supply voltage	All LED's off	POWER FAILURE: terminal 22-24-21	POWER FAILURE: terminal 22-24-21	None	Check if the supply voltage is connected correctly
Electronic control defective	Red: ON	POWER FAILURE: terminal 22-24-21	POWER FAILURE: terminal 22-24-21	None	Try to switch off and switch on the power supply. If the error remains please contact COMEM.
Heater 1 defective	Red: ON Blue: ON	SYSTEM FAILURE: terminal 12-14-11	POWER FAILURE: terminal 22-24-21	HEATER 1 FALL	Push the RESET(1) button in the terminal box. If the error remains the dehydrating breather should be replaced. Please contact COMEM.
Heater 2 defective	Red: ON Blue: OFF	SYSTEM FAILURE: terminal 12-14-11	POWER FAILURE: terminal 22-24-21	HEATER 2 FALL	Push the RESET(1) button in the terminal box. If the error remains the dehydrating breather continues to work because the main tank (1) is not damage. During the regeneration, for a short time, the salt in the tank 2 will not be regenerated and will continue to work. In this condition, the device may work for a long time. Please contact COMEM to replace it.
FAN 1 Defective	NOT indicated	-	-	WARNING: FAN1 FAIL	The device goes on to work correctly. The regeneration cycle will be longer than before.
FAN 2 Defective **(SDB-15/30)**	NOT indicated	-		WARNING: FAN2 FAIL	The device goes on to work correctly. The regeneration cycle will be longer than before.
WEIGHING CELL defect **(SDB-10/15/30)**	Red: ON Blue: ON	SYSTEM FAILURE: terminal 12-14-11	POWER FAILURE: terminal 22-24-21	TANK 1 NOT DRIED	Push RESET(1) button. If error remains it means that the weighing cell is damaged. Control of the weight is no longer possible, but the device works because of the backup time control. If the error remains the dehydrating breather should be replaced. Please contact COMEM.
SALT REPLACEMENT	Red: ON	SYSTEM FAILURE: terminal 12-14-11	POWER FAILURE: terminal 22-24-21	SALT REPLACEMENT	After a fixed number of regeneration cycles, COMEM advises to verify the device condition (contact COMEM for further details). Push the reset button to eliminate the error.
LOAD CELL outside range **(SDB-10/15/30)**	Red: ON	SYSTEM FAILURE: terminal 12-14-11	POWER FAILURE: terminal 22-24-21	LOAD > 10 Kg	Push RESET(1) button. If error remains it means that the weighing cell is damaged. Control of the weight is no longer possible, but the device works because of the backup time control. If the error remains the dehydrating breather should be replaced. Please contact COMEM.

Table 6

(1)RESET:
- SDB 10/15/30: push the both button (Start/Reset (M) – Stand by (N)) for 20 seconds
- SDB 010/012/015: push the external button for 5 seconds

5.4 Movement, transport and storage

Move the SDB-15/30 using the eyebolts in the upper part (Fig.4-5/F). The SDB-10/10C/12C/14C can be handled without any tools.
Handle the device with care.
When you remove the device from the transformer (for example during shipping operation), please follow the procedure:

- Switch off the supply voltage
- Remove the supply wire from the terminal box
- Turn the screw on the bottom side (Fig.21-33) with the maximum torque of 2 Nm (1.5 lbft) **(only for SDB-10/15/30)**

CAUTION

During the transformer transport, COMEM advises to disassemble the air breather and to place it inside the original box.

Not to paint the device. In this case any guarantees concerning the corrosion resistance decline.

Only mild soap and water should be used to clean the electrical box cover. Solvents must not be used for any reason as they will degrade the performance of the paint. Use of solvents on the unit will immediately void the warranty.

When you install the device please follow section 3, 4 and 5.

The SDB must be stored in the original packing and in a dry place with temperature in the range -10÷40°C (14÷104 °F).
Upon receiving the device, please check:

- The outer surface of the packaging to ensure that it is intact
- That there are no breakages

If damages are found, please contact Comem and provide the information from the shipping list and the serial number of the Self-dehydrating breather.

APPENDIX A: OPTIONS

A1: Flange DIN 45962 connection

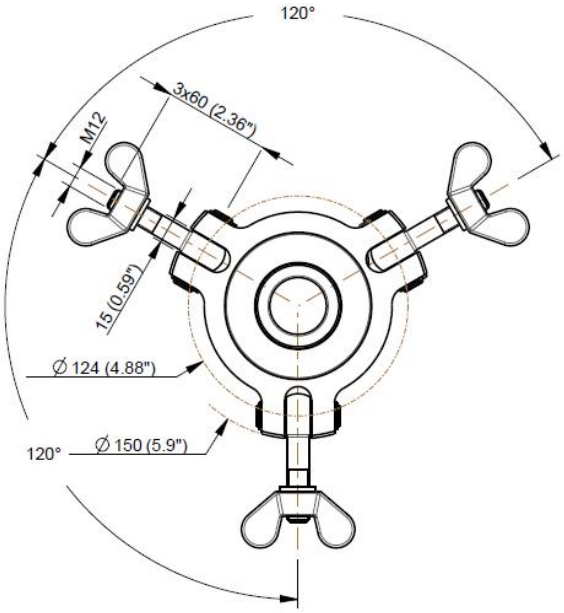


Fig.38

CAUTION

The minimum thickness flange has to be 15 mm

The rotation range shall be completely covered adjusting the position of SDB and fixing the locknut

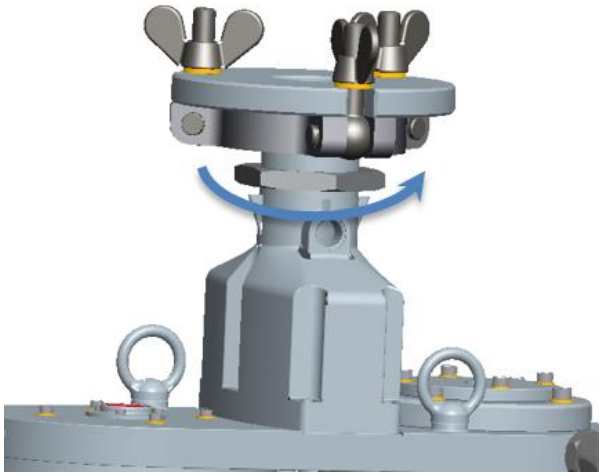


Fig.39

A2: Overpressure valve (kit 5CONE29800)

To avoid an overpressure in the conservator pipe in case of high discharge flow (advised for high quantity of oil (>80 tonn)). Comem suggests to assembly the overpressure valve kit (Fig. 40) with the following features:

- Mono directional flow
- Gasket material: NBR (-40°C)
- External material: AISI 303
- Open pressure: 0.15-0.35 bar

Fig.40

NOTE

The kit will has to be requested by the customer during the order phase and it will assembled on the SDB directly by Comem worker

A3: MODBUS register

A3.1 SDB-10C/12C/14C

	Register address	Operation	Notes
			Operation for controlling
	1	W	Start Cycle
	2	W	Abort Cycle
	3	W	Test Cycle
	4	W	Standby Off
	5	W	Reset Cycle
	6	W	Reset Log
	7	W	Self Test
			Operation for monitoring
	30101	R	Hour
	30102	R	Minute
	30103	R	Second
	30104	R	Day
	30105	R	Month
	30106	R	Year
	30107	R	T1
	30108	R	T2
	30109	R	Cycle status
	30110	E	EV status
	30111	R	N. of cycles
	30112	R	N. of available events (log)
	30113	R	Days to next cycle
	30114	R	Anti-Condensation Header State
			Data logging
EVENTO - 1	34001	R	Timestamp
	34002	R	
	34003	R	Cycle #
	34004	R	LogType
	34005	R	T1
	34006	R	T2
	…	…	…
EVENTO - 480	36881	R	Timestamp
	36882	R	
	36883	R	Cycle #
	36884	R	LogType
	36885	R	T1
	36886	R	T2

Table 7

A3.2 SDB-10/15/30

	Register address	Operation	Notes
			Operation for controlling
	0x1	W	Start Cycle
	0x2	W	Abort Cycle
	0x3	W	Test Cycle
	0x4	W	Standby Off
	0x5	W	Reset Cycle
	0x6	W	Reset Log
			Operation for monitoring
	0x2000	R	Salts Percentage
	0x2001	R	Temperature T1
	0x2002	R	Events number
	0x3000	R	Hours
	0x3001	R	Minutes
	0x3002	R	Seconds
	0x3003	R	Day
	0x3004	R	Month
			Data logging
EVENTO - 1	0x2100	R	Day Hour
	0x2101	R	
	0x2102	R	Cycles number
	0x2103	R	Event type
	0x2104	R	Salts weight
	0x2105	R	Temperature T1
	0x2106	R	Temperature T2
	0x2107	R	Temperature T3
	…	…	…
EVENTO - 480	0x2100	R	Day Hour
	0x2101	R	
	0x2102	R	Cycles number
	0x2103	R	Event type
	0x2104	R	Salts weight
	0x2105	R	Temperature T1
	0x2106	R	Temperature T2
	0x2107	R	Temperature T3

Table 8

A3.3 MODBUS address

When are installed two or more units, it is necessary to differentiate the MODBUS address changing the dip-switches position

The available SDB address are

- SDB-10/15/30: 1(default) to 16

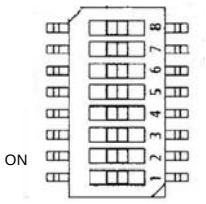


Fig.41

8	7	6	5	4	3	2	1	ADDRESS
ON	ON	ON	OFF	ON	ON	ON	ON	16
ON	ON	ON	ON	OFF	OFF	OFF	OFF	15
ON	ON	ON	ON	OFF	OFF	OFF	ON	14
ON	ON	ON	ON	OFF	OFF	ON	OFF	13
ON	ON	ON	ON	OFF	OFF	ON	ON	12
ON	ON	ON	ON	OFF	ON	OFF	OFF	11
ON	ON	ON	ON	OFF	ON	OFF	ON	10
ON	ON	ON	ON	OFF	ON	ON	OFF	9
ON	ON	ON	ON	OFF	ON	ON	ON	8
ON	ON	ON	ON	ON	OFF	OFF	OFF	7
ON	ON	ON	ON	ON	OFF	OFF	ON	6
ON	ON	ON	ON	ON	OFF	ON	OFF	5
ON	ON	ON	ON	ON	OFF	ON	ON	4
ON	ON	ON	ON	ON	ON	OFF	OFF	3
ON	ON	ON	ON	ON	ON	OFF	ON	2
ON	ON	ON	ON	ON	ON	ON	ON	1

Table 9

- SDB-10C/12C/14C: 160 – 175 (default)

Fig.42

4	3	2	1	ADDRESS
OFF	OFF	OFF	OFF	175
OFF	OFF	OFF	ON	174
OFF	OFF	ON	OFF	173
OFF	OFF	ON	ON	172
OFF	ON	OFF	OFF	171
OFF	ON	OFF	ON	170
OFF	ON	ON	OFF	169
OFF	ON	ON	ON	168
ON	OFF	OFF	OFF	167
ON	OFF	OFF	ON	166
ON	OFF	ON	OFF	165
ON	OFF	ON	ON	164
ON	ON	OFF	OFF	163
ON	ON	OFF	ON	162
ON	ON	ON	OFF	161
ON	ON	ON	ON	160

Table 10

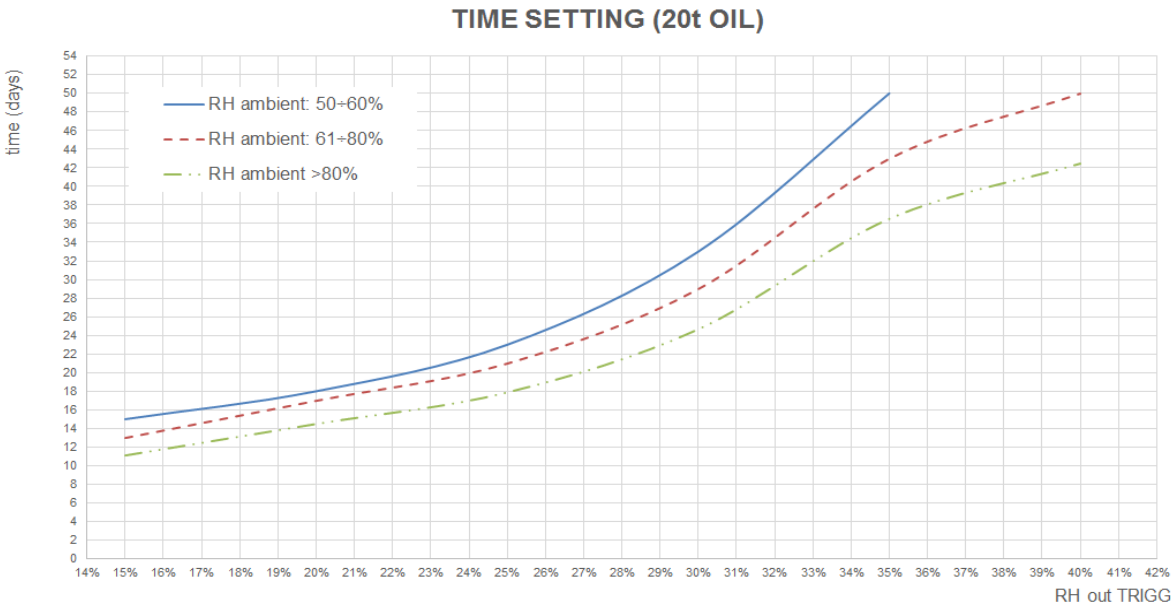
A4: SET TIME BETWEEN TWO REGENERATION PROCESSES (SDB-10C/12C/14C)

There is the possibility to set the time between two regeneration processes:

1. Pushing for 5 seconds the button (Fig.8/B) till the number on the display (Fig.8/A) starts to blink.
2. Pushing again the button until the selected time is reached (max selected time is 50 days).

The indicative time is showed in the graph 1 considering

- An average value (yearly) of the ambient humidity (%).
- An average value of the oil density.
- A temperature difference of 40 °C .
- A specific oil quantity (in the example 20 tons).
- An output relative humidity trigger (%)



Graph 1

Notes:

- As default, the pre-set time between two regeneration processes is 15 days for SDB-10C/12C and 20 days for SDB-14C.
- For any further information or specific cases, please contact COMEM.

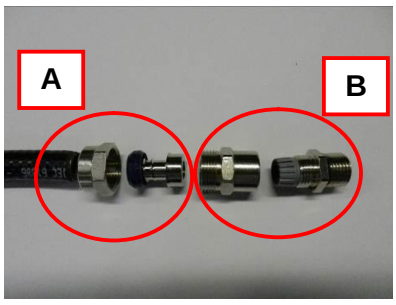
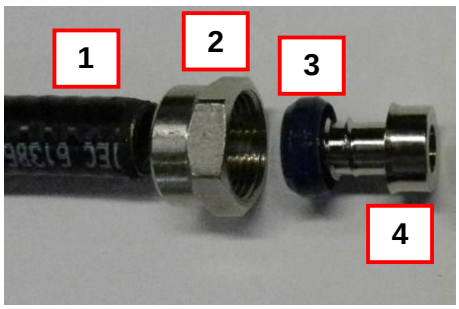
A5: SDB-10/10C Connection

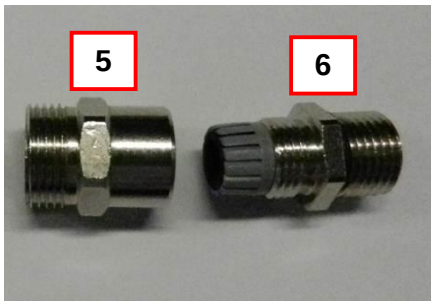
A5.1 Components

KIT: 5COE464103 composes by:

a) N°2 x 5COE464101: plug
b) 5COE459900: connection tube

A5.2 Operation instructions

Phase	Actions	Figures	Notes
1	Connect the “connection tube” pre-assembled with the plug to the main air dehumidifier (SDB-14C, SDB-15, SDB-30)		On the thread, apply some sealing glue (e.g. Loctite 542) to optimize yhe sealing. 
2	Cut the opposite side of the tube at the suitable length (according to installation layout)		After cutting, ensure there are no burrs.
3	The cable gland assembly has to be prepared		A: components to assembly on the tube B: components to assembly on SDB-010
3a	Components identification (A)		1: tube 2: connection washer 3: Internal gasket 4: Fixing screw

Phase	Action to do	Pictures	Notes
3b	Components identification (B)		5: connection spacer 6: plug
4	Pipe preparation: Insert the connection washer (2) on the tube (1)		
4a	Insert the internal gasket (3) on the tube (1)		
4b	Screw the fixing screw (4) in the tube (1)		The tube has to enter completely inside the fixing screw. Ensure no burrs are present.

Phase	Action to do	Pictures	Notes
5	Unscrew the SDB-10/10C plug		
5a	Screw the plug (6 – Phase 3b) in the hole		On the thread, apply some sealing glue (e.g. Loctite 542) to optimize the sealing 
5b	Screw the connector spacer (5) on the plug (6)		On the thread, apply some sealing glue (e.g. Loctite 542) to optimize the sealing. 
6	Connect the tube (phase 4b) to the SDB-010 (phase 5b)		On the thread, apply some sealing glue (e.g. Loctite 542) to optimize the sealing. 

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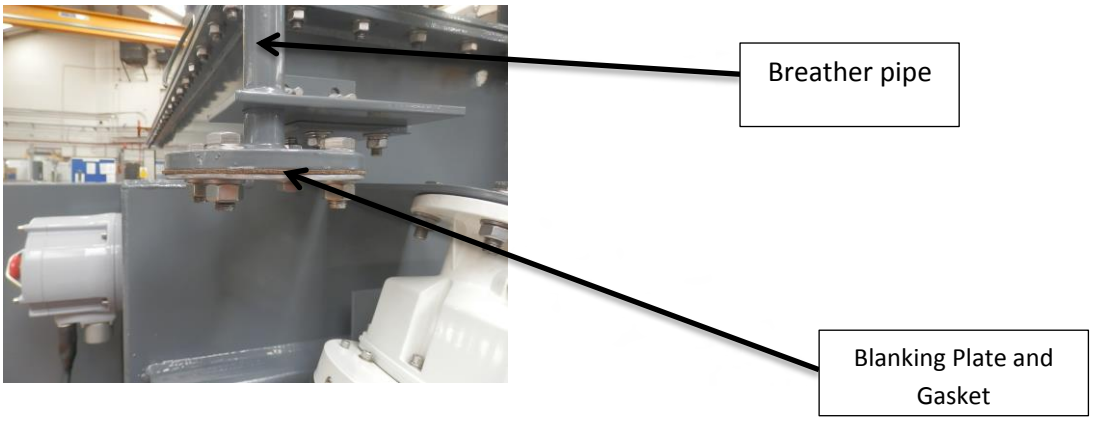
Assembly of Comem Self-Dehydrating Breather

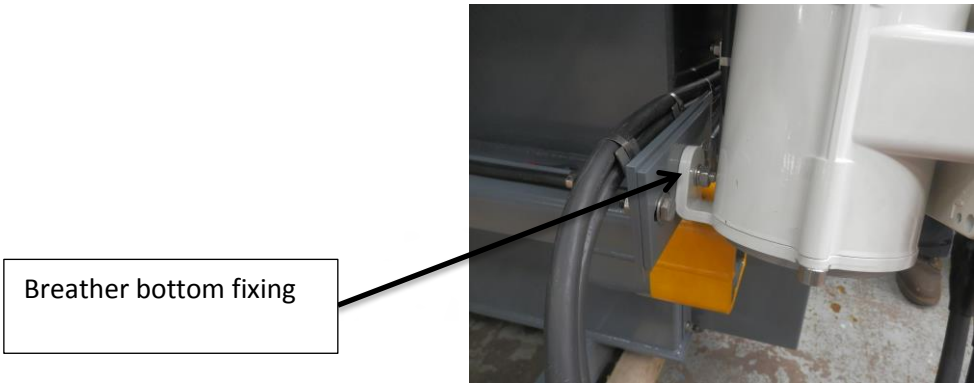
To ensure that there is no contamination of the breather with oil during transport to site, the transformer is shipped with the Comem Self-Dehydrating breather in a transit position. Before commisioning the transformer, the breather must be moved to it's service position.

The procedure for the re-positioning is as follows: -

a) Remove the blanking plate and gasket from the breather pipe flange.
WARNING: There will be a small quantity of oil in the pipework. Position a container underneath the flange to prevent any spillage of oil as the blanking plate is loosened. Allow the pipe to drain. If any oil is spilled this should be cleaned up before proceeding.
Retain the fasteners as these will be required later. The blanking plate and gasket can be discarded.



b) Slacken the fixing at the bottom of the breather sufficiently to allow the breather to rotate.



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www.istpower.com

c) Undo and remove the four fixings holding the breather top flange to the transit bracket. The sealing gasket for the breather is located in a groove in the top flange.
WARNING: This is a two person operation. The breather must be supported during this operation.

Breather to transit bracket fixings

d) Rotate the breather to the vertical position beneath the breather pipe flange. Make sure the flanges are clean and the gasket is seated correctly in its groove. Refit the fasteners that previously held the blanking plate.

Breather in service position

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e) The top fixings should be fitted as shown with the nuts underneath the top flange except for the fixing underneath the tank mounted bracket.

f) Re-tighten the breather bottom fixing.

g) Wipe down the area and make sure there is no residual oil contamination.

h) The breather has been pre-wired to the marshalling box. No further connections should be necessary.

i) Refer to the Comem instruction Manual for the device maintenance and installation instructions.

SECTION
11

APPENDIX E

L.V. FUSE SWITCH:
SOCOMEC 400A

(PRODUCT CATALOGUE - 5 PAGES)

FUSERBLOC

Fuse combination switches
for industrial fuses up to 1250 A


fuser_548_a_1_cat

FUSERBLOC
630 to 1250 A


fuser_532_a_1_cat

FUSERBLOC
32 to 400 A


fuser_539_a_1_cat

FUSERBLOC
20 to 32 A

Function

FUSERBLOC are manually operated multipolar fuse combination switches. They make and break on load and provide safety isolation and protection against overcurrent for any low voltage electrical circuit.

Advantages

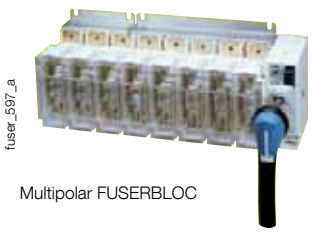
Improved safety
- Complete isolation of the fuse with double breaking per pole (top and bottom of fuse).
- Positive break indication.
- IP2X protection with terminal shrouds front panel.

High breaking capacity

Protection against overloads and short-circuits thanks to high breaking capacity fuses (100 kA rms).

Specific functionalities for simplified use
- TEST position for testing control circuits without power using U-type auxiliary contacts. In TEST position, the enclosure door can be opened.
- Mechanical or electronic fuse melting detection system (see DDMM or FMD).

Customised solutions


fuser_597_a

Multipolar FUSERBLOC


fuser_552_a

Centred operation

The solution for
- Motor load break
- Protection of industrial cabinet

Strong points
- Improved safety
- High breaking capacity
- Specific functionalities for simplified use

A complete range.
- Centred or left side operation, rear connections, plug-in connections. Please consult us.

Conformity to standards
- IEC 60947-3
- EN 60947-3
- BS EN 60947-3
- NBN EN 60947-3
- IEC 60269-1
- DIN EN 60269-1
- NF EN 60269-1
- IEC 60269-2
- VDE 0636-1
- VDE 0660-107
- Standards UL: see FUSERBLOC UL

Approvals and certifications(1)

(1) *Product reference on request.*

What you need to know

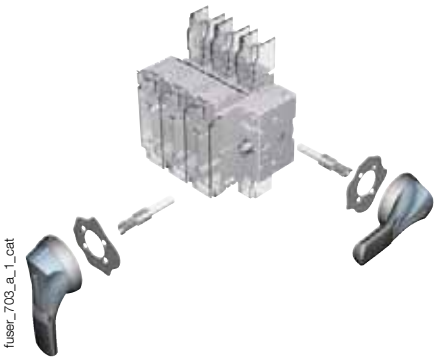
- In addition to the FUSERBLOC rating, product selection also depends on the fuse characteristics and functional specifications, which need to be in accordance with the application.
  SOCOMEC FUSERBLOC are available for utilisation with **NFC, DIN or BS88 fuses.**

- Whether it is 3 pole + switched neutral or 3 pole + solid neutral, the **FUSERBLOC** 20 to 32 A with **direct front operation** and **external operation** is the best suited solution in compact design.

- From 32 to 400 A, the FUSERBLOC is available in 2, 3 or 4 poles with **direct right side operation**.

- From 630 to 1250 A, the FUSERBLOC allows **direct** and **external front left** or **right** side operation in 2, 3 or 4 poles.

- With external operation, it is possible to operate the device in 3 ways:
  - **Front** operation
  - **Right side** operation
  - **Left side** operation.



- For ratings 20 to 400 A, the **flat mounting kit** provides a compact solution ideally suited to withdrawable applications.

- Maintenance of outputs from the DC common bus. The **FUSERBLOC LMDC** is the most compact solution and the most economical for your maintenance requirements (please consult us).

BS 88 - External front and side operation - 200 to 1250 A

Rating (A) Fuse size Frame size	Number of poles	Reference Switch I-0	Reference Changeover I - 0 - II	External front handle I-0	TEST External front handle I-0 TEST	External right side handle I -0	Changeover external front handle I - 0 - II	Shaft extensions for handle	Terminal shrouds[3]	U type A/C [2]	Integrated solid neutral link
CD 200 A A3-A4 (5) 13 A	2 P	3841 **2019**		Black S2 type IP55 1421 **2111**[1] Red/Yellow S2 type IP65 1424 **2111**	Black S2 type IP65 1423 **2115**[1] Red/Yellow S2 type IP65 1424 **2115**	Black S2 type IP55 1425 **2111**[1] Red/Yellow S2 type IP65 1428 **2111**	Black S2 type IP55 1421 **2113**[1] Red/Yellow S2 type IP65 1424 **2113**	320 mm 1400 **1032**	2 P 3998 **2016** 3 P 3998 **3016** 4 P 3998 **4016**	1 contact NO 3999 **0701** 1 contact NC 3999 **0702**	3829 **9320**
	3 P	3841 **3019**	3880 **3019**								
	4 P	3841 **6019**	3880 **6019**								
200 A B1-B2 15	2 P	3841 **2021**							2 P 3998 **2025** 3 P 3998 **3025** 4 P 3998 **4025**		3829 **9325**
	3 P	3841 **3021**	3880 **3021**								
	4 P	3841 **6021**	3880 **6021**								
250 A B1-B2-B3 15	2 P	3841 **2024**									
	3 P	3841 **3024**	3880 **3024**								
	4 P	3841 **6024**	3880 **6024**								
315 A B1-B2-B3 16	2 P	3841 **2031**							2 P 3898 **2040** 3 P 3898 **3040** 4 P 3898 **4040**		3829 **9339**
	3 P	3841 **3031**	3880 **3032**[6]								
	4 P	3841 **6031**	3880 **6032**[6]								
400 A B1-B2- B3-B4 16	2 P	3841 **2038**									
	3 P	3841 **3038**									
	4 P	3841 **6038**									
630 A C1-C2 17	2 P	3821 **2063**		Black S3 type IP65 1433 **3111**[1] Red/Yellow S3 type IP65 1434 **3111**		Black S3 type IP65 1437 **3111**[1] Red/Yellow S3 type IP65 1438 **3111**		320 mm 1400 **1232**	2 P 3898 **2080** 3 P 3898 **3080** 4 P 3898 **4080**		3829 **9308**
	3 P	3821 **3063**									
	4 P	3821 **6063**									
800 A C1-C2-C3 17	2 P	3821 **2080**									
	3 P	3821 **3080**									
	4 P	3821 **6080**									
1250 A D1 18	2 P	3821 **2120**		Black S4 type IP65 1443 **3111**[1]					3898 **2120**		3829 **9312**
	3 P	3821 **3120**							3898 **3120**		
	4 P	3821 **6120**							3898 **4120**		

(1) Standard.
(2) 4 auxiliary contacts as standard without additional contact holder.
(3) Top/bottom.
(4) 8 AC as standard without support (the support is for 8 additional auxiliary contacts).
(5) For fuse size A4: max diameter 31 mm.
(6) Terminal shrouds: 3 P - 3998 3025, 4 P - 3998 4025.

Accessories

Direct operation handle

For front operation

Rating (A)	Frame size	Figure no.	Handle colour	Reference
20 ... 32	0	1	Black	3629 **4012**
20 ... 32	0	1	Red	3629 **4013**
32 ... 400	11 ... 16	2	Black	3629 **7910**
630 ... 800	17	2	Black	3899 **6011**
800 ... 1250	18	3	Black	3899 **7011**

For right side operation

Rating (A)	Frame size	Figure no.	Handle colour	Reference
32 ... 63	1/2	4	Black	3629 **7900**
100 ... 400	3 ... 6	4	Black	3629 **7901**
630 ... 1250	17 ... 18	5	Black	1437 **7911**

Fig. 1

Fig.2

Fig. 3

Fig.4

Fig. 5

External front operation handle

Padlockable handle in position 0

Rating (A)	Frame size	Handle type	Handle colour	Operation	External IP(1)	Defeatable handle	Reference
CD 25 ... 63	0/11/12	S1	Black	I - 0	IP55	Yes	1411 **2111**
CD 25 ... 63	0/11/12	S1	Black	I - 0	IP65	Yes	1413 **2111**
CD 25 ... 63	0/11/12	S1	Red/Yellow	I - 0	IP65	Yes	1414 **2111**
CD 25 ... 63	0/11/12	S1	Black	I - 0 - Test	IP65	Yes	1413 **2115**
CD 25 ... 63	0/11/12	S1	Red/Yellow	I - 0 - Test	IP65	Yes	1414 **2115**
100 ... 400	13 ... 16	S2	Black	I - 0	IP55	Yes	1421 **2111**
100 ... 400	13 ... 16	S2	Black	I - 0	IP65	Yes	1423 **2111**
100 ... 400	13 ... 16	S2	Red/Yellow	I - 0	IP65	Yes	1424 **2111**
100 ... 400	13 ... 16	S2	Black	I - 0 - Test	IP55	Yes	1423 **2115**
100 ... 400	13 ... 16	S2	Red/Yellow	I - 0 - Test	IP65	Yes	1424 **2115**
630 ... 800	17	S3	Black	I - 0	IP65	Yes	1433 **3111**
630 ... 800	17	S3	Red/Yellow	I - 0	IP65	Yes	1434 **3111**
800 ... 1250	18	S4	Black	I - 0	IP65	Yes	1443 **3111**
800 ... 1250	18	S4	Red/Yellow	I - 0	IP65	Yes	1444 **3111**

(1) IP: protection degree according to IEC 60529 standard.

Padlockable handle in position 0 and I

Rating (A)	Frame size	Handle type	Handle colour	External IP(1)	Reference
CD 25 ... 63	0/11/12	S1	Black	IP65	1413 **2311**
100 ... 400	13 ... 16	S2	Black	IP65	1423 **2311**

(1) IP: protection degree according to IEC 60529 standard.

S1 type handle

S2 type handle

S3 type handle

S4 type handle

External right side operation handle

Rating (A)	Frame size	Handle type	Handle colour	External IP(1)	Reference
CD 25 ... 63	0/11/12	S1	Black	IP55	1415 **2111**
CD 25 ... 63	0/11/12	S1	Black	IP65	1417 **2111**
CD 25 ... 63	0/11/12	S1	Red/Yellow	IP65	1418 **2111**
100 ... 400	13 ... 16	S2	Black	IP55	1425 **2111**
100 ... 400	13 ... 16	S2	Black	IP65	1427 **2111**
100 ... 400	13 ... 16	S2	Red/Yellow	IP65	1428 **2111**
630 ... 1250	17/18	S3	Black	IP65	1437 **3111**
630 ... 1250	17/18	S3	Red/Yellow	IP65	1438 **3111**

(1) IP: protection degree according to IEC 60529 standard.

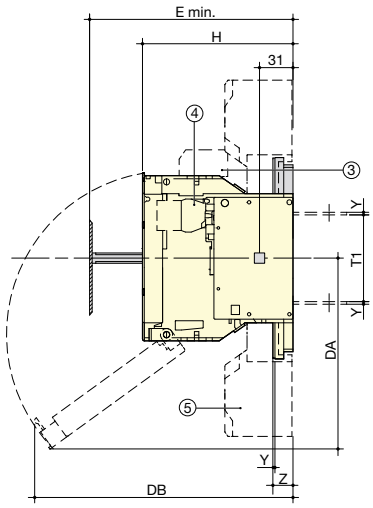

S1 type handle

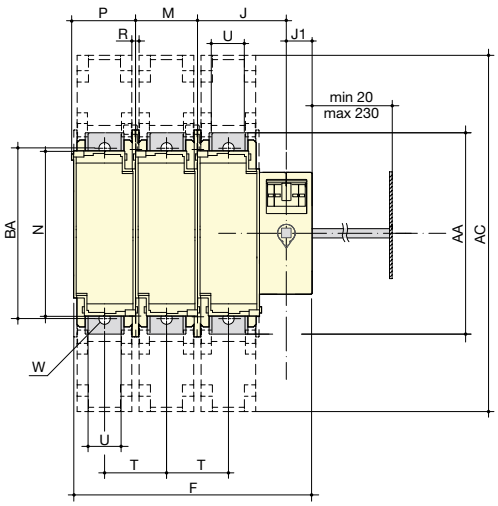
S3 type handle

Dimensions (continued)

External operation

BS88 32 to 250 A - NFC and DIN 50 to 250 A



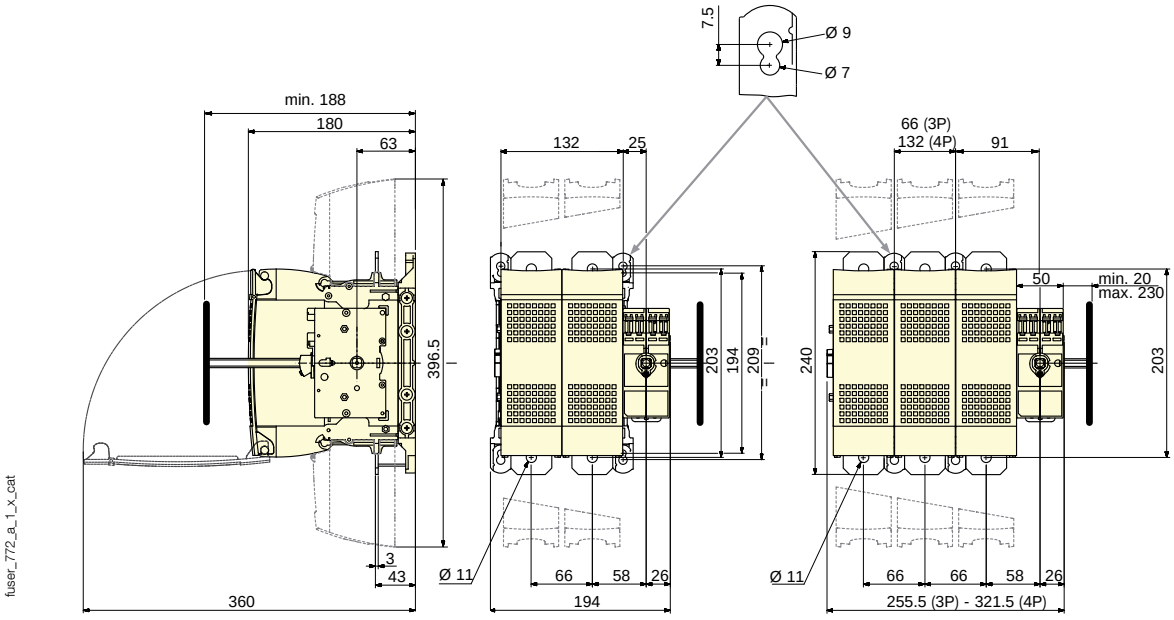


fuser_417_a_1_x_cat

1. Position TEST.
2. Rear connection (option)
3. 1 or 2 CA type DDMM
4. 1 or 8 CA NO/NC pre-break.
5. Terminal shrouds.

Rating (A)	NFC/DIN Fuse size	BS88 Fuse size	Frame size	Overall dimensions E min	Terminal shrouds AC	Switch body F 3p.	F 4p.	H	J	J1	BC	DA	DB	Switch mounting M	N	P	R	Connection T	T1	U	W	Y	Z	AA	BA
32		A1	11	100	-	121	148	87	45	18	70	85	153	27	106	31	6	27	59	12	-	2	-	118	-
50	14 x 51	-	11	100	-	121	148	87	45	18	70	85	153	27	106	31	6	27	59	12	-	2	-	118	-
63	00C	A2-A3	12	125	-	136	168	116	50	18	70	159	145	32	106	36	5.4	32	59	12	-	2	-	118	-
100	22x58	A4	13	135	268	148	184	116	54	18	125	141	187	36	127	40	5.4	36	62	20	8.5	2.5	19.5	162	141
125	22x58	-	13	135	268	148	184	116	54	18	125	141	179	36	127	40	5.4	36	62	20	8.5	2.5	19.5	162	141
125	00	-	13	135	268	148	184	126	54	18	125	141	193	36	127	40	5.4	36	62	20	8.5	2.5	19.5	162	141
160	00	-	13	135	268	148	184	126	54	18	125	141	193	36	127	40	5.4	36	62	20	8.5	2.5	19.5	162	141
CD 160 CD 200	-	A3-A4	13A	145	268	148	184	139	54	18	125	141	-	36	130	40	5.4	36	78	18	8.5	3	20	162	141
160	0	A4-B1-B2	14	145	268	190	240	136	64	18	125	174	229	50	140	54	5.4	50	62	20	8.5	2.5	19.5	162	141
200	-	B1-B2	15	154	345	234	294	146	86	25	125	185	251	60	162	64	6.4	60	84	32	11	2.5	19.5	195	166
250	1	B1-B2-B3	15	154	345	234	294	146	86	25	125	185	251	60	162	64	6.4	60	84	32	11	2.5	19.5	195	166

BS88 315 to 400 A (size B1-B2-B3-B4) - DIN 400 A (size 2)



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SECTION 12

APPENDIX F

PAINT SPECIFICATION:
No. 704-60170

(PAINT PROCEDURE - 15 PAGES)

IST POWER LTD

PAINT APPLICATION AND PREPARATION PROCEDURE FOR

LIQUID FILLED TRANSFORMERS FOR C3 (H) PROTECTION (>15 years)

AND C4 (M) PROTECTION (5 – 15 YEARS)

Quality Process Instruction

Quick Guide

a) All sharp edges and corners must be removed; welds dressed smooth, all welding spatter should be removed.
b) All areas are to be thoroughly cleaned of any contamination before metal spraying or painting.
c) The manufacturers paint datasheets form part of this specification and must be adhered to.
d) Paint records must be taken

Circulation/storage
REFER TO "ISSUED DOCUMENT REGISTER" HELD BY COMPLIANCE

Ref: 704-60170 Issue: 3	Author: Peter Jones Approved for Issue: Peter Jones Date: 18/9/18	Change Ref: G287

Safety

1. Review and adhere to all instructions contained in the company HSE Policies ref.GHI-001 & 002 (see company notice boards).
2. Review and adhere to all paint safety data sheet instructions referenced in this instruction (copies in COSHH folders)
3. PPE required: Full face respiratory mask, gloves, coveralls and safety footwear. Ensure no loose items of clothing or accessories.
4. Maintain a clean & tidy work area – remove potential trip hazards
5. Near Miss and HSE concerns must be reported by the "ARF" system, or directly to the Health & Safety Representative/Manager

Scope

This specification covers the cleaning, preparation & preservation of ONAN & KNAN steel tanks for outdoor use in extreme weather conditions, and salt laden & heavily polluted environments.

Summary of corrosion protection system

The corrosion protection of the steel components of the transformers will be as follows:

Interior

- Blast clean
- 2 pack Epoxy paint

Exterior

- Blast clean
- 2 pack Epoxy zinc phosphate/micaceous iron oxide primer
- 2 pack Acrylic Polysiloxane finish

The manufacturers paint datasheets form part of this specification.

During the painting process the manufacturer guidelines for mixing, spraying, curing/drying & over coating are to be followed.

Pre-blast clean inspection

All sharp edges and corners must be removed; welds dressed smooth, all welding spatter should be removed.

All welds are to be dressed smooth in accordance with the 'good' standard of ISO 12944-3. All welds must be inspected for undercuts/irregularities and made good where necessary.

Exterior

Blast clean

The exterior of the transformer tanks and conservators to be grit blasted to SA 2 1/2 of ISO 8501-1. Particular attention is to be made in hard to reach areas.

Mask stainless steel earth pads before blasting.

All areas are to be thoroughly cleaned of any contamination before metal spraying.

Exterior Painting

A stripe coat is required on all edges, welds and hard to reach areas for all layers of paint.

Primer/Sealer

Paint Manufacturer: International
Paint Type: Two component epoxy primer
Paint Description: Intercure 200
No of coats: One
Coat thickness: 80 µm (minimum DFT)
Colour: Light Grey
Drying Time:

Temperature	Touch Dry	Hard Dry	Minimum
5˚C	40 min	4.5 hours	3 hours
15˚C	30 min	3 hours	2 hours
25˚C	20 min	2 hours	1 hours
40˚C	15 min	30 min	30 min

Finish coat

Paint Manufacturer: International
Paint Type: Two component acrylic polysiloxane
Paint Description: Interfine 979
No of coats: One
Coat thickness: 100 µm (minimum DFT)
Colour: Refer to tank fabrication drawing for Final Colour
Drying Time:

Temperature	Touch Dry	Hard Dry	Minimum
5˚C	6 hours	8 hours	8 hours
15˚C	4.5 hours	6 hours	6 hours
25˚C	3 hours	4 hours	4 hours
40˚C	1.5 hours	2.5 hours	2.5 hours

Note: Minimum external dry film thickness is 180 microns

Interior

Blast Clean

The interior of the transformer tanks and conservators it to be grit blasted to SA 2 ½ of ISO 8501-1. All surplus grit and residue must be removed before painting.

Painting is to be carried out within four hours of grit blasting.

Interior Painting

All of the transformer interior should be painted with Valspar 39,0009-50.

Interior paint

Paint Manufacturer: Valspar
Paint Type: Two component epoxy primer
Paint Description: Valspar
No of coats: One
Coat thickness: 40 µm (minimum DFT)
Colour: White

Temperature	Touch Dry	Hard Dry	Minimum
20°C		6 hours	6 hours

Paint Repair Procedure

If the paint coating is damaged in any way, repairs must be done to the following procedure.

Using hand or mechanical means, rub down the affected area so that all paint coats are feathered towards the damaged area.

Clean down and thoroughly degrease.

Each coat of paint is to overlap the previous coat. Minimum film thicknesses are to be maintained.

All coats of paint are to be applied by brush.

Primer/Sealer

Paint Manufacturer: International
Paint Type: Two component epoxy primer
Paint Description: Intercure 200
No of coats: One
Coat thickness: 80 µm (minimum DFT)
Colour: Light Grey
Drying Time:

Temperature	Touch Dry	Hard Dry	Minimum
5°C	40 min	4.5 hours	3 hours
15°C	30 min	3 hours	2 hours
25°C	20 min	2 hours	1 hour
40°C	15 min	30 min	30 min

Finish coat

Paint Manufacturer: International
Paint Type: Two component acrylic polysiloxane
Paint Description: Interfine 979
No of coats: One
Coat thickness: 100 µm (minimum DFT)
Colour: Refer to tank fabrication drawing for Final Colour
Drying Time:

Temperature	Touch Dry	Hard Dry	Minimum
5°C	6 hours	8 hours	8 hours
15°C	4.5 hours	6 hours	6 hours
25°C	3 hours	4 hours	4 hours
40°C	1.5 hours	2.5 hours	2.5 hours

Note: Minimum external dry film thickness is 180 microns

Intercure® 200

Rapid Recoat Epoxy

PRODUCT DESCRIPTION

A two component epoxy zinc phosphate/micaceous iron oxide primer, formulated on proprietary polymer technology, which provides rapid cure and overcoating even under low temperature conditions.

A high solids, low VOC product.

INTENDED USES

As a primer for steelwork intended for use in a wide range of aggressive environments, including offshore, chemical and petrochemical plants, industrial buildings, pulp and paper mills, power plants and bridges.

Suitable for overcoating within 3 hours in most climatic conditions hence speeding up production and throughput in fabrication shops.

Can also be used on site as a rapid curing, maintenance coating.

PRACTICAL INFORMATION FOR INTERCURE 200

Colour	Buff, Red Oxide
Gloss Level	Matt
Volume Solids	67%
Typical Thickness	75-100 microns (3-4 mils) dry equivalent to 112-149 microns (4.5-6 mils) wet
Theoretical Coverage	8.90 m²/litre at 75 microns d.f.t and stated volume solids 358 sq.ft/US gallon at 3 mils d.f.t and stated volume solids
Practical Coverage	Allow appropriate loss factors
Method of Application	Airless Spray, Air Spray, Brush, Roller

Drying Time

			Overcoating Interval with recommended topcoats	
Temperature	**Touch Dry**	**Hard Dry**	*Minimum*	*Maximum*
5°C (41°F)	40 minutes	4.5 hours	3 hours	Extended[1]
15°C (59°F)	30 minutes	3 hours	2 hours	Extended[1]
25°C (77°F)	20 minutes	2 hours	1 hour	Extended[1]
40°C (104°F)	15 minutes	30 minutes	30 minutes	Extended[1]

[1] See International Protective Coatings Definitions and Abbreviations

Maximum overcoating intervals are shorter when using polysiloxane topcoats. Consult International Protective Coatings for further details.

REGULATORY DATA

Flash Point	Part A 27°C (81°F); Part B 28°C (82°F); Mixed 27°C (81°F)	
Product Weight	1.60 kg/l (13.4 lb/gal)	
VOC	2.67 lb/gal (320 g/lt) 213 g/kg	EPA Method 24 EU Solvent Emissions Directive (Council Directive 1999/13/EC)

See Product Characteristics section for further details

ECOTECH

Ecotech is an initiative by International Protective Coatings a world leader in coating technology to promote the use of environmentally sensitive products across the globe.

SURFACE PREPARATION

All surfaces to be coated should be clean, dry and free from contamination. Prior to paint application all surfaces should be assessed and treated in accordance with ISO 8504:2000.

Oil or grease should be removed in accordance with SSPC-SP1 solvent cleaning.

Abrasive Grit Blast Cleaning

Abrasive grit blast clean to Sa2½ (ISO 8501-1:2007) or SSPC-SP6. If oxidation has occurred between blasting and application of Intercure 200, the surface should be reblasted to the specified visual standard.

Surface defects revealed by the blast cleaning process should be ground, filled, or treated in the appropriate manner.

A sharp, angular surface profile of 50-75 microns (2-3 mils) is recommended.

Intercure 200 is suitable for application to grit blast cleaned surfaces which were initially to the above standard but have been allowed to deteriorate under good shop conditions for up to 7-10 days. The surface may deteriorate to Sa2 standard but must be free from loose powdery deposits.

Shop Primed Steel

Weld seams and damaged areas should be grit blast cleaned to Sa2½ (ISO 8501-1:2007) or SSPC-SP6.

If the shop primer shows extensive or widely scattered breakdown overall grit sweep blasting may be necessary.

If the shop primer was applied over shot blasted surfaces, overall grit sweep blasting will be necessary prior to application of Intercure 200.

APPLICATION

Mixing

Material is supplied in two containers as a unit. Always mix a complete unit in the proportions supplied. Once the unit has been mixed it must be used within the working pot life specified.

(1) Agitate Base (Part A) with a power agitator.
(2) Combine entire contents of Curing Agent (Part B) with Base (Part A) and mix thoroughly with power agitator.

Mix Ratio

3 part(s) : 1 part(s) by volume

Working Pot Life

5°C (41°F)	15°C (59°F)	25°C (77°F)	40°C (104°F)
6 hours	3 hours	2 hours	45 minutes

Airless Spray	Recommended	Tip Range 0.43-0.53 mm (17-21 thou) Total output fluid pressure at spray tip not less than 176 kg/cm² (2503 p.s.i.)
Air Spray (Pressure Pot)	Recommended	Gun DeVilbiss MBC or JGA Air Cap 704 or 765 Fluid Tip E
Brush	Suitable - small areas only	Typically 50-75 microns (2.0-3.0 mils) can be achieved
Roller	Suitable - small areas only	Typically 50-75 microns (2.0-3.0 mils) can be achieved
Thinner	International GTA220 (or International GTA415)	Do not thin more than allowed by local environmental legislation
Cleaner	International GTA220	(or International GTA415)

Work Stoppages

Do not allow material to remain in hoses, gun or spray equipment. Thoroughly flush all equipment with International GTA220. Once units of paint have been mixed they should not be resealed and it is advised that after prolonged stoppages work recommences with freshly mixed units.

Clean Up

Clean all equipment immediately after use with International GTA220. It is good working practice to periodically flush out spray equipment during the course of the working day. Frequency of cleaning will depend upon amount sprayed, temperature and elapsed time, including any delays.

All surplus materials and empty containers should be disposed of in accordance with appropriate regional regulations/legislation.

PRODUCT CHARACTERISTICS

Intercure 200 is preferred for use with systems for chemical environments where zinc based materials can be subject to attack in both acidic and alkaline conditions.

The maximum overcoating interval will be dependent upon the integrity of the exposed film. A film of 75 microns (3 mils) dry film thickness will normally be overcoatable after 6 months exposure provided it is adequately cleaned and any areas of mechanical damage repaired.

Over-application should be avoided as thick films will not be as good a substrate for topcoat adhesion after ageing as those at the specified thickness. When using as a blast holding primer avoid over-application as thick films may suffer from cohesive film splitting if subsequent coats are also over-applied.

Surface temperature must always be a minimum of 3°C (5°F) above dew point.

This product must only be thinned using recommended International thinners. The use of alternative thinners, particularly those containing ketones, can severely inhibit the curing mechanism of the coating.

Intercure 200 is capable of curing at temperatures below 0°C (32°F). However, this product should not be applied at temperatures below 0°C (32°F) where there is a possibility of ice formation on the substrate.

For further details regarding cure times and overcoatability, please contact International Protective Coatings.

This product is not available in pale and pastel shades due to a tendency to discolour rapidly. Additionally, in common with all epoxies Intercure 200 will chalk on exterior exposure. However, these phenomena are not detrimental to anti-corrosive performance.

In C1 and C2 corrosive environments (ISO 12944) it is possible to repair weld seams and small damaged areas via hand or power tool cleaning. Consult International Protective Coatings for more information.

Intercure 200 is not intended for use as a primer for steelwork which may be subjected to immersion conditions.

Intercure 200 can also be used as a primer for substrates other than blasted steel, e.g. stainless steel, alloys, etc. Consult International Protective Coatings for further details.

Absolute measured adhesion of topcoats to aged Intercure 200 is less than that to fresh material, however, it is adequate for the specified end use.

Note: VOC values quoted are based on maximum possible for the product taking into account variations due to colour differences and normal manufacturing tolerances.

Low molecular weight reactive additives, which will form part of the film during normal ambient cure conditions, will also affect VOC values determined using EPA Method 24.

SYSTEMS COMPATIBILITY

Intercure 200 will normally be applied to suitably prepared steel, e.g. blast cleaned. However, if necessary, application over prefabrication blast primers can be performed. Consult International Protective Coatings for further details.

The following primers are recommended for Intercure 200:

Interzinc 22 (mist coat or tie coat may be required)*

The following topcoats/intermediates are recommended for Intercure 200:

Intercure 420	Interseal 670HS
Interfine 979	Interthane 990
Intergard 475HS	Interzone 1000
Intergard 740	Interzone 954

For other suitable topcoats/intermediates, consult International Protective Coatings.

*See relevant product data sheet for details.

ADDITIONAL INFORMATION

Further information regarding industry standards, terms and abbreviations used in this data sheet can be found in the following documents available at www.international-pc.com:

- Definitions & Abbreviations
- Surface Preparation
- Paint Application
- Theoretical & Practical Coverage

Individual copies of these information sections are available upon request.

SAFETY PRECAUTIONS

This product is intended for use only by professional applicators in industrial situations in accordance with the advice given on this sheet, the Material Safety Data Sheet and the container(s), and should not be used without reference to the Material Safety Data Sheet (MSDS) which International Protective Coatings has provided to its customers.

All work involving the application and use of this product should be performed in compliance with all relevant national, Health, Safety & Environmental standards and regulations.

In the event welding or flame cutting is performed on metal coated with this product, dust and fumes will be emitted which will require the use of appropriate personal protective equipment and adequate local exhaust ventilation.

If in doubt regarding the suitability of use of this product, consult International Protective Coatings for further advice.

PACK SIZE	Unit Size	Part A		Part B	
		Vol	Pack	Vol	Pack
	20 litre	15 litre	20 litre	5 litre	5 litre
	4 US gal	3 US gal	5 US gal	1 US gal	1 US gal
	For availability of other pack sizes, contact International Protective Coatings.				

SHIPPING WEIGHT	Unit Size	Part A	Part B
	20 litre	29.1 kg	5.3 kg
	4 US gal	49.8 lb	8.8 lb

STORAGE		
	Shelf Life	12 months minimum at 25°C (77°F). Subject to re-inspection thereafter. Store in dry, shaded conditions away from sources of heat and ignition.

Important Note

Issue date: 07/07/2009

www.international-pc.com

Interfine® 979

Acrylic Polysiloxane

PRODUCT DESCRIPTION

A patented (US 6,281,321 and EP 0 941290), high performance, two component, high solids inorganic hybrid finish which offers compliance to all current VOC legislation, and contains no free isocyanates.

Interfine 979 significantly improves upon the gloss and colour retention exhibited by typical polyurethane finishes as well as offering improvement in gloss and colour retention when compared to 1st generation epoxy modified polysiloxane finishes.

Interfine 979 also displays the same corrosion resistance and has enhanced mechanical properties when compared to traditional epoxy technology.

INTENDED USES

Interfine 979 is part of International's premium range of polysiloxane finishes. It is designed to provide excellent long-term colour and gloss retention and provide extended lifetime to first maintenance when utilised as part of a high performance anti-corrosive system. Interfine 979 is intended for use in those market sectors where visual impact is important, and the need for a high standard of cosmetic appearance is required. These include high performance constructions such as bridges, offshore structures and tank farms in addition to general industrial and commercial steelwork where high levels of cosmetic performance are a key requirement.

The dual benefits of corrosion protection & high cosmetic appearance afforded by Interfine 979 mean that as well as exhibiting superior durability, this product also serves as an effective barrier coat similar to a traditional epoxy intermediate, and as such, allows a reduction in the total number of coats required from a multi-coat high performance system - saving application costs, and improving productivity during application.

PRACTICAL INFORMATION FOR INTERFINE 979

Colour	Wide range via the Chromascan system
Gloss Level	Gloss
Volume Solids	76%
Typical Thickness	100-150 microns (4-6 mils) dry equivalent to 132-197 microns (5.3-7.9 mils) wet
Theoretical Coverage	6.10 m²/litre at 125 microns d.f.t and stated volume solids 244 sq.ft/US gallon at 5 mils d.f.t and stated volume solids
Practical Coverage	Allow appropriate loss factors
Method of Application	Airless Spray, Air Spray, Brush, Roller

Drying Time

			Overcoating Interval with recommended topcoats	
Temperature	**Touch Dry**	**Hard Dry**	*Minimum*	*Maximum*
5°C (41°F)	6 hours	8 hours	8 hours	Extended[1]
15°C (59°F)	4.5 hours	6 hours	6 hours	Extended[1]
25°C (77°F)	3 hours	4 hours	4 hours	Extended[1]
40°C (104°F)	1.5 hours	2.5 hours	2.5 hours	Extended[1]

[1] On other undercoats consult Interfine 979 Recommended Working Procedures or Interspec for specific details.
The drying times quoted have been determined at the quoted temperature and 50% relative humidity.
In warmer climates (>25°C (77°F)) and/or those that have a tendency for high relative humidity (>60%), an alternative curing agent is available which will allow improved product workability. See Product Characteristics.

REGULATORY DATA

Flash Point (Typical)	Part A 32°C (90°F); Part B 55°C (131°F); Mixed 35°C (95°F)	
Product Weight	1.33 kg/l (11.1 lb/gal)	
VOC	1.81 lb/gal (218 g/lt) 162 g/kg	EPA Method 24 EU Solvent Emissions Directive (Council Directive 1999/13/EC)

See Product Characteristics section for further details

SURFACE PREPARATION

All surfaces to be coated should be clean, dry and free from contamination. Prior to paint application all surfaces should be assessed and treated in accordance with ISO 8504:2000.

Primed Surfaces

Interfine 979 should always be applied over a recommended anti-corrosive coating scheme. The primer surface should be dry and free from all contamination and Interfine 979 must be applied within the overcoating intervals specified (consult the relevant product data sheet).

Areas of breakdown, damage etc., should be prepared to the specified standard (e.g. Sa2½ (ISO 8501-1:2007) or SSPC-SP10, Abrasive Blasting, or SSPC-SP11, Power Tool Cleaning) and patch primed prior to the application of Interfine 979.

Metallic Zinc Primed Surfaces

Ensure that the surface of the primer is clean, dry and free from contamination and zinc salts before application of Interfine 979. Ensure zinc primers are fully cured before overcoating.

APPLICATION

Mixing

Material is supplied in two containers as a unit. Always mix a complete unit in the proportions supplied. Once the unit has been mixed it must be used within the working pot life specified.

(1) Agitate Base (Part A) with a power agitator.
(2) Combine entire contents of Curing Agent (Part B) with Base (Part A) and mix thoroughly with power agitator.

Mix Ratio

4.00 part(s) : 1.00 part(s) by volume

Working Pot Life

5°C (41°F)	15°C (59°F)	25°C (77°F)	40°C (104°F)
3.5 hours	2.5 hours	2 hours	1.5 hours

Note: Pot life times are applicable to both curing agent grades.

Airless Spray	Recommended	Tip Range 0.28-0.53 mm (11-21 thou) Total output fluid pressure at spray tip not less than 155 kg/cm² (2204 p.s.i.)
Air Spray (Conventional)	Recommended	Gun DeVilbiss MBC or JGA Air Cap 704 or 765 Fluid Tip E
Brush	Suitable	Typically 50-75 microns (2.0-3.0 mils) can be achieved
Roller	Suitable	Typically 50-75 microns (2.0-3.0 mils) can be achieved
Thinner	International GTA007	Do not thin more than allowed by local environmental legislation
Cleaner	International GTA007	

Work Stoppages

Do not allow material to remain in hoses, gun or spray equipment. Thoroughly flush all equipment with International GTA007. Once units of material have been mixed they should not be resealed and it is advised that after prolonged stoppages work recommences with freshly mixed units.

Clean Up

Clean all equipment immediately after use with International GTA007. It is good working practice to periodically flush out spray equipment during the course of the working day. Frequency of cleaning will depend upon amount sprayed, temperature and elapsed time, including any delays.

All surplus materials and empty containers should be disposed of in accordance with appropriate regional regulations/legislation.

Interfine® 979

Acrylic Polysiloxane

PRODUCT CHARACTERISTICS

The detailed Interfine 979 Application Guidelines should be consulted prior to use.

Level of sheen and surface finish are dependent on application method. Avoid using a mixture of application methods whenever possible. Best results in terms of gloss and appearance will always be obtained by conventional air spray application.

When applying Interfine 979 by brush or roller, it may be necessary to apply multiple coats to achieve the total specified system dry film thickness.

This product must only be thinned using recommended International thinners. The use of alternative thinners, particularly those containing alcohols and ketones, can severely inhibit the curing mechanism of the coating.

After mixing a slight exotherm may be noted, which is typical of this product and is a result of chemical reaction.

Pot life times must not be exceeded even though the material may be still liquid and appear useable. It is good working practice that application should commence with full unopened units of material. Due to the moisture sensitivity with partially filled units of the curing agent component, there is a danger of reaction with atmospheric moisture which could adversely affect the performance of the final coating film. This phenomenon will be more prominent in the faster drying grade of curing agent where mixed product surface skinning in the container may occur more readily, particularly in warmer climates and / or those with high humidity.

Surface temperature must always be a minimum of 3°C (5°F) above dew point.

When applying Interfine 979 in confined spaces ensure adequate ventilation.

Care must be taken when spray applying multiple coats of Interfine 979 to ensure that a continuous wet film is applied and a minimum dry film thickness of 100 microns (4 mils) is achieved. Failure to do so may result in pinholing which will detract from ultimate appearance and performance.

Interfine 979 will cure satisfactorily at relative humidities between 40% and 85%. Curing will be slower at lower humidities and faster at higher humidities.

Condensation occurring during or immediately after application may result in a matt finish and an inferior film.

When overcoating after weathering or ageing, ensure the coating is fully cleaned to remove all surface contamination such as oil, grease, salt crystals and traffic fumes, before application of a further coat of Interfine 979.

Premature exposure to ponding water will cause colour change, especially in dark colours and at low temperatures.

Absolute measured adhesion of topcoats to aged Interfine 979 is less than that to fresh material, however, it is adequate for the specified end use.

This product is not recommended for use in immersion conditions. When severe chemical or solvent splashing is likely to occur contact International Protective Coatings for information regarding suitability.

Note: VOC values are typical and are provided for guidance purpose only. These may be subject to variation depending on factors such as differences in colour and normal manufacturing tolerances.

Low molecular weight reactive additives, which will form part of the film during normal ambient cure conditions, will also affect VOC values determined using EPA Method 24.

Alternative Curing Agent

For improved product workability in warmer climates and / or those with high relative humidity.

The drying times quoted have been determined at the quoted temperature and 50% relative humidity.

			Overcoating Interval with recommended topcoats	
Temperature	**Touch Dry**	**Hard Dry**	*Minimum*	*Maximum*
5°C (41°F)	10 hours	24 hours	24 hours	Extended[1]
15°C (59°F)	6 hours	12 hours	12 hours	Extended[1]
25°C (77°F)	4 hours	8 hours	8 hours	Extended[1]
40°C (104°F)	2 hours	6 hours	6 hours	Extended[1]

[1] On other undercoats consult Interfine 979 Recommended Working Procedures or Interspec for specific details.

SYSTEMS COMPATIBILITY

Interfine 979 can be applied over a limited range of primers and intermediates.

Suitable primers are:

Intercure 200	Intercure 200HS
Interzinc 52	Interplus 356
Interzinc 315	Interzinc 22
Interzinc 52HS	

Suitable intermediates are:

Intercure 420	Intergard 475HS
Interseal 670HS	Interzone 505
Interzone 954	

Interfine 979 must not be applied directly over Interzinc 52 low temperature grade cure (EPA176).

Absolute maximum overcoating intervals with Interfine 979 are dependent upon primer/intermediate. Interfine 979 Recommended Working Procedures must be consulted prior to use.

Interfine 979 should only be overcoated with itself.

Interfine® 979

Acrylic Polysiloxane

ADDITIONAL INFORMATION

Further information regarding industry standards, terms and abbreviations used in this data sheet can be found in the following documents available at www.international-pc.com:

- Definitions & Abbreviations
- Surface Preparation
- Paint Application
- Theoretical & Practical Coverage
- Interfine 979 Application Guidelines

Individual copies of these information sections are available upon request.

SAFETY PRECAUTIONS

This product is intended for use only by professional applicators in industrial situations in accordance with the advice given on this sheet, the Material Safety Data Sheet and the container(s), and should not be used without reference to the Material Safety Data Sheet (MSDS) which International Protective Coatings has provided to its customers.

All work involving the application and use of this product should be performed in compliance with all relevant national, Health, Safety & Environmental standards and regulations.

In the event welding or flame cutting is performed on metal coated with this product, dust and fumes will be emitted which will require the use of appropriate personal protective equipment and adequate local exhaust ventilation.

If in doubt regarding the suitability of use of this product, consult International Protective Coatings for further advice.

PACK SIZE	Unit Size	Part A		Part B	
		Vol	Pack	Vol	Pack
	20 litre	16 litre	20 litre	4 litre	5 litre
	5 US gal	4 US gal	5 US gal	1 US gal	1 US gal
	For availability of other pack sizes, contact International Protective Coatings.				

SHIPPING WEIGHT (TYPICAL)	Unit Size	Part A	Part B
	20 litre	24.3 kg	4.4 kg
	5 US gal	49.6 lb	8.8 lb

STORAGE	Shelf Life	Part A: 12 months minimum at 25°C (77°F). Part B: 6 months minimum at 25°C (77°F). Subject to re-inspection thereafter. Store in dry, shaded conditions away from sources of heat and ignition.

Valspar Industries GmbH

Informacja techniczna

EP-farba do gruntowania
Nr art. 39,0009-50
Nr art. 588.33.99 utwardzacz

Ausgabe 06/04 Rev. 2
390009-50 Sch

Charakterystyka: Dwuskładnikowa farba epoksydowa, zawierająca rozcieńczalnik organiczny, schnąca na powietrzu i w suszarce. Nie zawiera chromu i ołowiu..

Zastosowanie: Farba gruntująca dla konstrukcji żelaznych i stalowych, dla odpowiedzialnych systemów antykorozyjnych oraz jako warstwa gruntująca dla powierzchni ocynkowanych takich jak: kadzie transformatorów, pokrywy, konserwatory i radiatory.
Farba EP Art. nr. 39,009 – 50 została dopuszczona przez Firmy ABB i ALSTOM do malowania powierzchni wewnętrznych transformatorów.

Dane techniczne:

Wszystkie dane dotyczą farby zmieszanej z utwardzaczem (art. nr. 588.33.99) w stosunku wagowym 5:1. Dane określone zostały dla warunków znormalizowanych, 20°C i 65% wilgotności względnej.

Nr art.			**39,0009-50**
Kolor			biały
Stosunek mieszania, wagowy			5:1
		Prüfnormen nach DIN	
Gęstość	(g/cm^3)	53217	1,45
Zawartość części stałych	(%)	53216	ca. 68
Objętość części stałych	(cm^3 / kg)	53219	ca. 330
Objętość części stałych	(%)	53219	ca. 48
Wydajność teoretyczna przy 40 µm	(m^2 / kg)	55945	ca. 8,5
Lepkość		53219	strukturalna
Czas schnięcia przy 20 °C i 40 µm grubości warstwy suchej:			
Stopień 1		53150	po 20 minutach
Stopień 4		53150	po 5 godzinach
Stopień 6		53150	po 6 godzinach
Do zestawów z farbami **„Valspar“:**			EP, EPW, PUR, ACN
Osągalna grubość powłoki:	polewanie		40 µm
	natrysk		80 µm
Odporność na temp. -suche powietrze			do 150 °C
Max. czas magazynowania			12
Rozcieńczalnik specjalny : Art. nr.			39.0410

Wskazówki dotyczące przygotowania:

Powierzchni: Najlepiej metodą strumienio-ścierną wg. DIN 55928 część 4, stopień czystości Sa 2,5 - 3. Należy zachować uśrednioną wysokość nierówności R_z , zgodnie z normą DIN 4768 część 1 lub DIN ISO 8503 część 1. Im większa jest wysokość nierówności, tym grubsza musi być warstwa powłoki malarskiej, tak aby osiągnąć tzw. „wystarczające pokrycie wierzchołków nierówności powierzchni". Trwałość ochrona warstwy malarskiej zależy w znacznej mierze od dokładności przygotowania podłoża przed malowaniem.

Farby: w razie potrzeby należy używać rozcieńczalnika art.-nr. 39.0410:

Nakładanie pędzlem	Bez rozcieńczania. Tylko w wyjątkowych przypadkach
Natrysk metodą powietrzną	Ustawić odpowiednią lepkość farby przez dodanie 10- 20 % rozcieńczalnika. Dysza 1,5 - 1,8 mm / ciśnienie powietrza 4-5 bar
Natrysk Airless	Lepkość dostawcza. Rozcieńczać tylko w wyjątkowych przypadkach. Dysza 0,43-0,55 mm / kąt natrysku 40° (w zależności od wielkości obiektu), ciśnienie natrysku 150-200 bar.
Natrysk Airmix, Air-Coat	Lepkość dostawcza, ewentualnie ustawić odpowiednią lepkość farby przez dodanie 3 – 10 % rozcieńczalnika, dysza 0,28 - 0,45 mm / kąt natrysku 20 - 65° (w zależności od wielkości obiektu), ciśnienie natrysku 50 - 100 bar; ciśnienie powietrza wspomagającego 1-4 bar.
Czas przydatności zmieszanych składników przy 20 °C	około 12 godzin, w zbiorniku do polewania max. 8 godzin!
Temperatura pracy	min +5 °C!
Temp.obiektu / wilg.wzgl.	min +3 °C powyżej punktu rosy / max. 85 %!

Uwagi: Minimalny czas konieczny do nałożenia farby nawierzchniowej na bazie PUR lub ACN wynosi:
16 godz przy 20 ^{0}C temp. obiektu 2 godz. przy 40 ^{0}C temp. obiektu, 1 godz. przy 60 ^{0}C temp. obiektu.
Nałożenie farby nawierzchniowej EP, przy temp. obiektu 20 ^{0}C, możliwe jest najwcześniej :
-przy grubości warstwy suchej 40µm po 4 godz, -przy grubości warstwy suchej 80µm po 8 godz.
Przy temperaturach +5,+10 ^{0}C należy stosować "szybki" utwardzacz Art.nr. 39,0809
Grubość powłoki suchej przy malowaniu wnętrza transformatora nie może przekraczać 80 m

Przykładowy zestaw warstw malarskich:
Farbą EP można kilkakrotnie przemalowywać powierzchnię gruntowaną.

np.:	farba do gruntowania EP biała	nr art. 39,0009-50	
	farba międzywarstwowa EP	nr art. 39,0075 -50	
	farba nawierzchniowa ACN	nr art. 41, 7633	lub
	farba do gruntowania EP biała	nr art. 39,0009-50	
	farba międzywarstwowa EP z miką	nr art. 39,0915-F	
	farba nawierzchniowa ACN	nr art. 41,7633	

Do malowania nawierzchniowego można stosować wszystkie farby - wymienione w pozycji na stronie pierwszej - Do zestawów z farbami **„Valspar"-**
Dane techn. dot. farby międzywarstwowej i nawierzchniowej zawarte są w odrębnych informacjach.

Dane bezpieczeństwa:	**farba bazowa: 39,0009-50**	**utwardzacz:588.33.99**
Temperatura zapłonu	24°C	24 °C
Klasa zagrożenia wg VbF	nie dotyczy	A II
Przepisy transportowe wg ADR/RID	patrz nadruk na opakowaniu lub „Karta danych bezpieczeństwa"	
Znakowanie wg EWG 88/379	patrz nadruk na opakowaniu lub „Karta danych bezpieczeństwa"	

Środki bezpieczeństwa: Przy stosowaniu produktu należy zachować wszelkie środki ostrożności obowiązujące w odniesieniu do materiałów malarskich, wynikające z „Karty danych bezpieczeństwa". Są to np.: „Przepisy dot. zapo-biegania nieszczęśliwym wypadkom" VBG 23, Branżowego Stowarzyszenia Przemysłu Chemicznego.

Niniejsza publikacja unieważnia wszystkie wcześniejsze wersje Informacji Technicznej dot. w/w farby.

UWAGA:
Pisemne lub ustne zalecenia techniczno-aplikacyjne dot. naszych produktów, przekazywane jako pomoc naszym Klientom, nie są zobowiązujące i nie stanowią podstawy do jakichkolwiek dodatkowych roszczeń z tytułu zawarcia umowy kupna. Zalecenia te opracowane zostały zgodnie z naszymi doświadczeniami i zgodnie z aktualnym stanem wiedzy naukowej i praktycznej. Nie zwalniają one Kupującego od samodzielnej kontroli przydatności naszego produktu do przewidzianego zastosowania. Ponadto obowiązują nasze ogólne warunki dostaw i płatności.

SECTION 13

APPENDIX G

TEST CERTIFICATES: 101687/3-01

(TESTING & CONFORMANCE - 2 PAGES)

iST POWER

IST POWER LTD

64/66 Percy Road, Leicester, LE2 8FN (reg'd office) Tel: +44 (0)116 283 3321

Longley Lane, Sharston Industrial Estate, Wythenshawe, Manchester, M22 4RU Tel: +44 (0)161 428 9507

Email:- sales@istpower.com Web: www.istpower.com

TRANSFORMER TEST CERTIFICATE

CUSTOMER : Brush **ELECTRICAL SPEC :** 0105317 REV. 1

RATING kVA : 200 3 **PHASE** 50 **Hz** **SERIAL No :** 101687/3-01

	PRIMARY	SECONDARY
RATED VOLTS :	11000	415
RATED AMPS :	10.5	278

TEMPERATURE CLASS : A **COOLING :** ONAN **VECTOR GROUP :** ZNyn11

REFERENCE TEMP. °C : 75

THIS TRANSFORMER HAS BEEN TESTED IN ACCORDANCE WITH SPECIFICATION

BS EN 60076-1 2011

AND HAS SATISFACTORILY PASSED THE FOLLOWING TESTS

VOLTAGE RATIO AT NO LOAD : AS RATED VOLTS

WINDING RESISTANCE AT 20 DEGREES C :

	PRIMARY Ohms	SECONDARY milli Ohms
A - B	2.68	10.75
B - C	2.68	10.76
C - A	2.68	10.71

TEST RESULTS

SHORT CIRCUIT IMPEDANCE :	**%**	3.19
LOAD LOSS :	**Watts**	2419
NO LOAD LOSS :	**Watts**	825
NO LOAD CURRENT :	**%**	1.07
ZERO SEQUENCE IMPEDANCE :	**Ohms per ph.**	19.78

INDUCED OVERVOLTS : 200% AT 100Hz FOR 60 Seconds

SEPARATE SOURCE VOLTS PRIMARY : 28kV AT 50Hz FOR 60 Seconds

SEPARATE SOURCE VOLTS SECONDARY : 3kV AT 50Hz FOR 60 Seconds

INSULATION RESISTANCE PRIMARY TO SEC AND EARTH : 53 G Ohms

INSULATION RESISTANCE SECONDARY TO EARTH : 57 G Ohms

REMARKS :

TESTED : Michael Harry **APPROVED :** Michael Harry

WITNESSED : _____ **DATE :** 29/03/2021

iST POWER

IST POWER LTD

64/66 Percy Road, Leicester, LE2 8FN (reg'd office) Tel: +44 (0)116 283 3321

Longley Lane, Sharston Industrial Estate, Wythenshawe, Manchester, M22 4RU Tel: +44 (0)161 428 9507

Email:- sales@istpower.com Web: www.istpower.com

CERTIFICATE OF CONFORMANCE

CUSTOMER : Brush

IST ELECTRICAL SPEC : 0105317 REV. 1

SPECIFICATION : BS EN 60076-1 2011

SERIAL No : 101687/3-01

CUSTOMER PART No : **ISSUE :**
(If Applicable)

The goods identified by the above unique serial number have been tested and inspected to the above specification and have been proved to conform in all respects with your order.

APPROVED : Michael Harry TEST ENGINEER

DATE : 29/03/2021