iST POWER

Longley Lane
Wythenshawe
Manchester

M22 4RU Tel: +44 (0)161 428 9507
Email: sales@istpower.com
Web: www.istpower.com

INSTALLATION, COMMISSIONING, OPERATION & MAINTENANCE INSTRUCTIONS

SIEMENS Mobility Ltd.

50kVA 25kV SINGLE PHASE AUXILIARY TRANSFORMER

DETAILS

MANUAL NUMBER: **MM0716**
ISSUE: 1

TRANSFORMER SPECIFICATION: **0105517**

CUSTOMER ORDER NUMBER: **4513287740**

SERIAL NUMBERS: **103005/1-01**

REVISION RECORD

Revision	ECN	Change	Author	Date
0	-	First Issue	R.L.	16/05/2022
1	M2093	Updated DWG.014038 – Rating & Diagram Plate to Issue.1 (Latest).	R.L.	17/05/2022

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SECTION
1

DESCRIPTION

1.1 Preface

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

The auxiliary transformer is a single phase, outdoor, Mineral Oil cooled transformer for 25kV 50Hz 1 phase supply. The secondary output voltage is 400V 1 phase.

1.2 Technical Description

Type	Mineral Oil cooled double wound auxiliary transformer.
Cooling	ONAN, Nynas Nytro Libra to IEC 60296
Continuous Rating	50 kVA
Rated Input Voltage	25 kV
Rated Output Voltage	400 V
Rated Input Current	2 A
Rated Output Current	125 A
Basic Insulation Level	70 kV (RMS) 170 kV (Peak)
Frequency	50 Hz
Phases	1

Input Termination	1 x 52kV 630A Euromold Series 900 Equipment Bushing - Type F2 (M16 x 2 – 6H) Located inside a bolted enclosed H.V. terminal box.
Neutral Termination	1 x 35kV 800A Cooper Series 700 Equipment Bushing - Type E (5/8” – 11UNC – 2B) Located inside a bolted enclosed H.V. terminal box. Connected to Earth.
Output Termination	2 Pole 250A MCCB ABB TMAX T4N (PR221DS-LS/I) Set to trip at 160A.

Fittings	Name Rating and Diagram Plate Pressure Relief Device Dehydrating Breather Oil Level Sight Glass Oil Drain and Filter Valves Earthing Terminal Conservator Tank Lifting Lugs Common Skid Base
Weight of Core and Coils	510 kg
Liquid Quantity	545 Litres
Total Weight	1570 kg
	Specification IEC 60076

1.3 Detailed Description

The transformer consists of a single phase coil assembly each mounted on a two leg 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 mineral 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 transformers are contained within a fully welded steel tank with a bolted-on lid. The tank is complete with pressure relief device, drain & filter valves, conservator, and dehydrating breather.

The input lead is made onto the H.V. bushing 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 250A trip MCCB, set to trip at 160A.

The unit is filled with Nynas Nytro Libra mineral insulating oil. See Appendix A for Product Data Sheet and Safety Data Sheet.

1.3.1 Transformer Tank and Termination Boxes

The transformer tank is of sheet steel welded construction.

The H.V. line (A2) is located at the side of the tank inside the H.V. terminal box, behind a bolted access cover. The H.V. terminal is suitable for a Type F2 interface with bolted M16 connection.

The Neutral bushing (A1) is located alongside the H.V. bushing inside the H.V. terminals box, behind a bolted access cover. It is of a Type E interface equipment bushing pre-assembled with the separable connector bolted to an earth connection bar (as shown in DWG.013794).

The L.V. connections are made at the L.V. cable box via a MCCB set at 160A trip. See Appendix D for manufacturer details.

1.3.2 Auxiliary Equipment

The transformers are fitted with the following equipment: -

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

Other fittings include removable cable gland plates, oil filter and drain valves and oil level sight glass. A loose Envirogel dehydrating breather to be fitted on site is included.

SECTION 2

INSTALLATION INSTRUCTIONS

2.1 Introduction

These instructions are intended to give guidance and assistance in the installation and maintenance of the mineral oil filled single phase auxiliary 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 1570kg. 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 dispatched full of mineral 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 flat level foundation.

2) 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 MCCB. 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.

3) The H.V. lead is connected to the terminal A2. Refer to Section 6.1 for details.

4) Ensure that an efficient earth connection is made to the earth connection bar at the bottom the tank with two M12 bolted connections.

5) The transformer breather is shipped as a loose item with the transformer. This will be attached to the outside of the transformer or be inside the L.V. switch box. There will also be a copy of the breather fitting instructions. To attach the breather, it is necessary to remove the ¾" BSP cap from the end of the breather tube. During transport, a small quantity of oil may find its way into the breather tube. This must be allowed to drain before fitting the breather to prevent the breather material being contaminated. To prevent a spillage of mineral oil, position a 5-litre container beneath the breather tube before removing the end cap. Dispose of any mineral oil in an approved manner. Screw the breather onto the end of the breather pipe. The breather must be fitted in accordance with the manufacturer instruction leaflet. See Appendix C for the breather details and the fitting instruction leaflet.

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 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.**

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.

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.

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

3. Reconnect all leads.

3.3 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 B for manufacturer details.

3.4 De-Hydrating Breather

Desiccant breather charges must be checked on a regular basis in accordance with the manufacturers instructions supplied in this manual. We recommend that the condition of the gel should be checked every 12 months.

Refer to Appendix C for manufacturer details.

3.5 L.V. MCCB Switch

The L.V. MCCB is a 250A unit (ABB Model T4N).
It is set to trip at 160A.

Refer to Appendix D for manufacturer details.

3.6 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 Goose Grey to BS 4800 REF:00A05. The corrosion protected is in accordance with Network Rail specification RT/CE/S/039 (RT98).

SECTION 4

OPERATING INSTRUCTIONS

4.1 Unit Isolation

The transformer has no inherent means of input isolation. The supply to the transformer of 25kV single phase must therefore be isolated remotely and the terminals earthed.

NOTE **Isolate all supplies prior to working on this equipment.**

SECTION 5

MAINTENANCE INSTRUCTIONS

NOTE **Maintenance must only be carried out when the equipment has been totally isolated.**

5.1 Oil Sampling

The insulating liquid is Nynas Nytro Libra mineral 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 mineral oil.

NOTE **Replace or top up with Nynas Nytro Libra mineral oil or equivalent to IEC 60296.**

5.2 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 B for manufacturer data.

5.3 L.V. MCCB Switch

The L.V. MCCB Switch requires no maintenance.

Refer to Appendix D for details.

5.4 General

The housing of the pressure relief device, L.V. MCCB 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.

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.

5.5 Torque Settings

Maximum tightening torque settings for threaded metric steel Grade 8.8 bolts. Threads are to be lightly lubricated.

Bolt Size	Approximate Torque (Nm)
M5	7
M6	12
M8	30
M10	55
M12	100
M16	245
M20	480

5.6 Spill Management

5.6.1 Personal precautions

Spilt product can constitute a slip hazard. Avoid contact with skin and eyes.

5.6.2 Environmental precautions

In the event of a large spillage, clean as thoroughly as possible and contact local authority. Avoid flushing into drains.

5.6.3 Cleaning procedures

Use an inert absorbent material (e.g. sand, oil absorbent granules, etc.) and place in labelled containers. Product and packaging must be disposed of in accordance with local and national regulations.

5.7 Recommended Spares

Due to the nature of the product, there are very few items that will degrade during the lifespan of the transformer. The only item that will require replacement is the desiccant breather charge. The correct item for the transformer is listed below:

Transformer	Breather Charge
50 kVA	Brownell Type R1

The waste parts must be disposed of in a suitable manner in accordance to environmental regulations.

5.8 Disposal

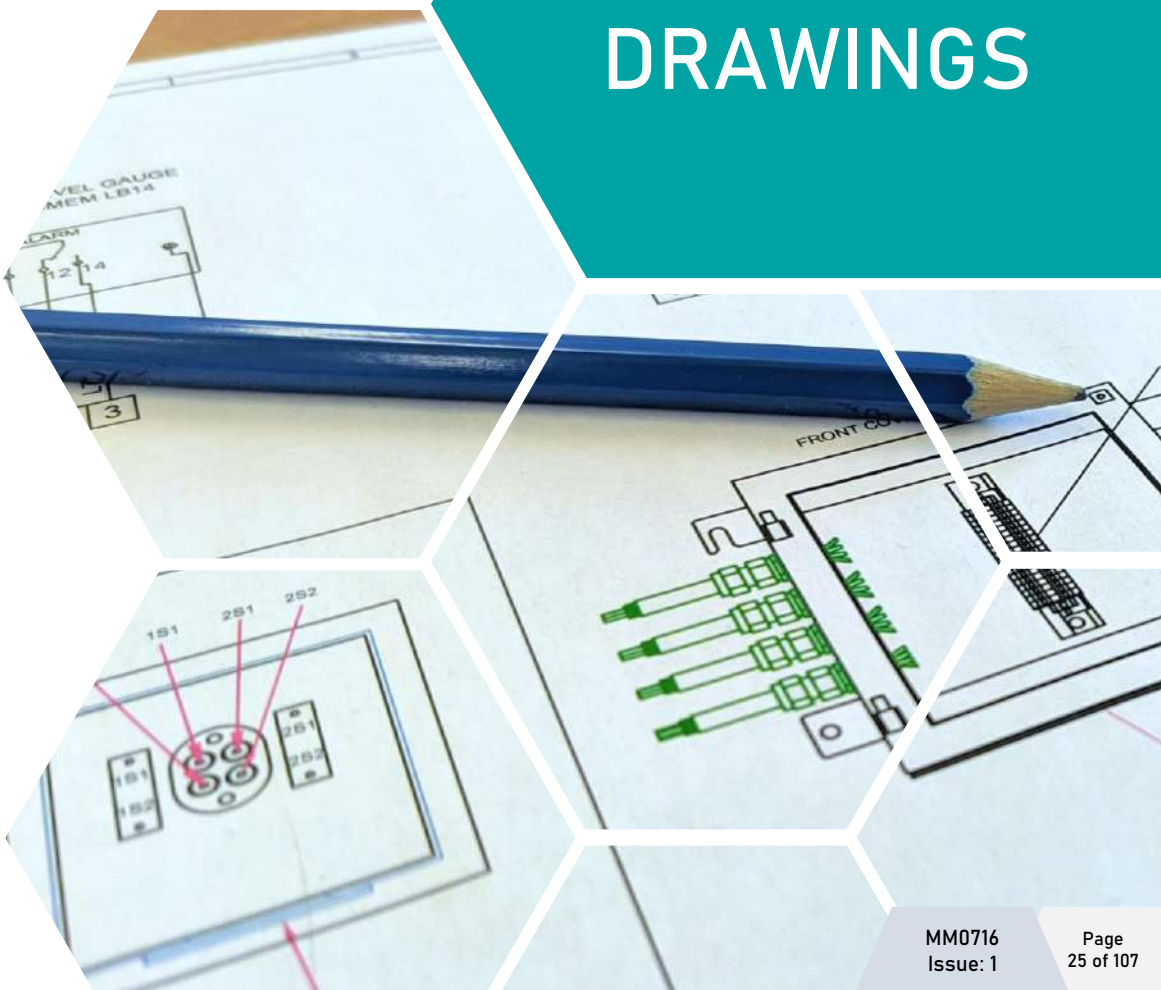
Disposal of this equipment at the end of its operational life must be in accordance with the environmental legislation in force at the time of disposal.

The transformer is constructed in such a way that the different components can easily be recycled at the end of its life span. However, the components can only be recycled after the cooling liquid has been drained. The liquid should be drained and disposed of by a specialist waste contractor in accordance with local regulations.

NOTE **The transformer does not contain any PCBs, PCTs, PCBTs or asbestos material. Consider using the services of a specialist recycling company who have the capacity, skills and knowledge to recycle transformers.**

SECTION 6

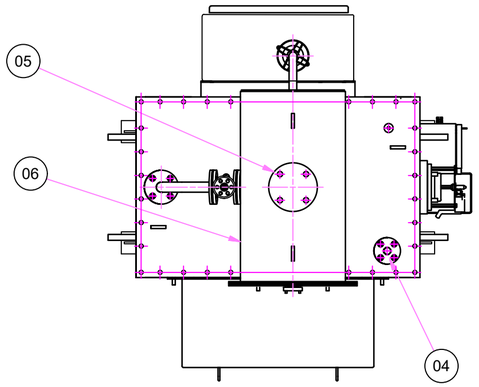
LIST OF DRAWINGS

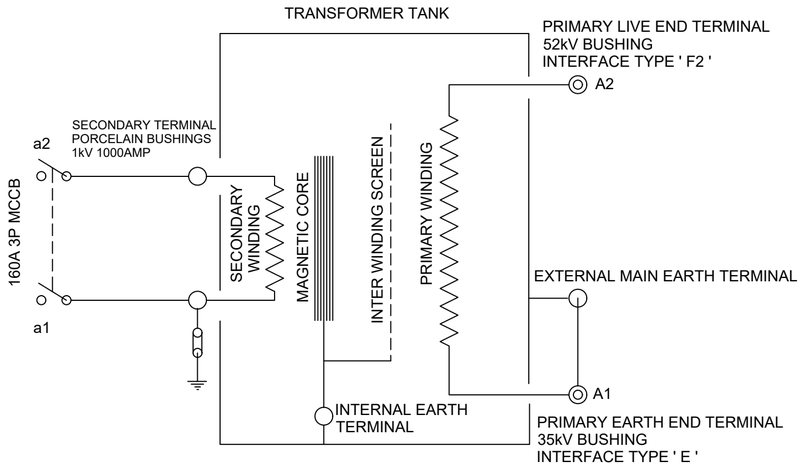


6.1 List of Drawings

013794	Outline Drawing
014038	Rating and Diagram Plate
014405	Auxiliary Wiring Diagram

DO NOT SCALE - IF IN DOUBT ASK

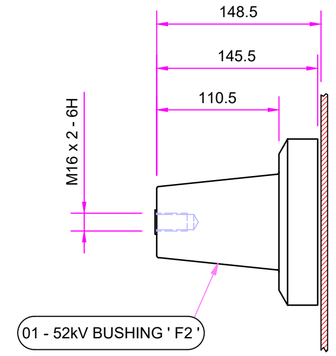


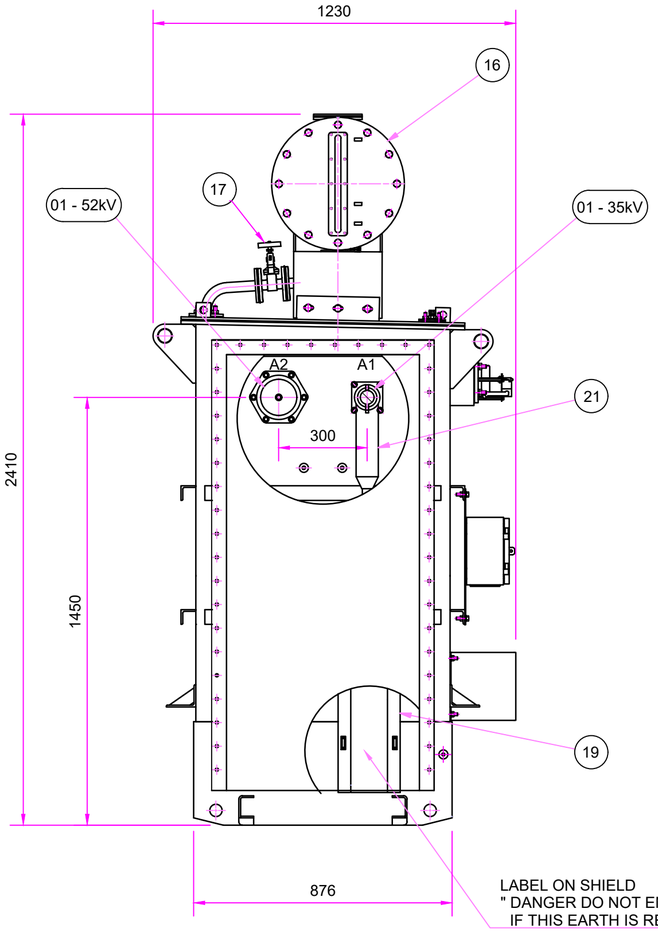


50kVA 25kV 400V SINGLE PHASE TRANSFORMER	
REFS	DESCRIPTION
01	PRIMARY BUSHINGS : 1 - 52kV BUSHING TYPE 'F2 INTERFACE. 1 - 35kV BUSHING TYPE 'E' INTERFACE - CONNECTED TO EARTH PAD
02	2 - SECONDARY BUSHINGS , ESI STD 1kV 630AMPS
03	ABB T4N TMAX PR221LS 160A MCCB (SET I1=0.72, T1=3.0, I2/3=3.5, S/I=I)
04	THERMOMETER POCKET - 1/2" BSP
05	CONSERVATOR FILLER FLANGE - DN50
06	CONSERVATOR
07	SILICA GEL BREATHER - BROWNELL TYPE 'T'
08	MAIN LIFTERS - 45DIA HOLE
09	AUXILIARY WIRING MARSHALLING BOX
10	PRESSURE RELIEF VALVE
11	JACKING POINTS
12	EARTH PAD - 50 X 20 X 200LG C/W M12 HOLES
13	LABEL - RATING AND DIAGRAM PLATE
14	SKID UNDERBASE WITH 42DIA HAULAGE HOLES
15	DRAIN VALVE C/W OIL SAMPLING VALVE - DN25 - PAD LOCKABLE
16	CONSERVATOR REMOVABLE END WITH PRISMATIC OIL GAUGE
17	CONSERVATOR ISOLATING VALVE - DN25
18	CONSERVATOR DRAIN VALVE - 1/2" BSP
19	EARTH CONNECTION SHIELD - PADLOCKABLE FOR SAFETY
20	HV ANTI - VANDAL COVER
21	HV 25kV 95mm2 CU EARTH END CONNECTION (SUPPLIED)

ESTIMATED WEIGHTS AND OVERALL DIMENSIONS	
ITEMS	KG
CORE AND COILS ASSY	510
COMPLETE WITH 545 LTRS OF OIL	1570

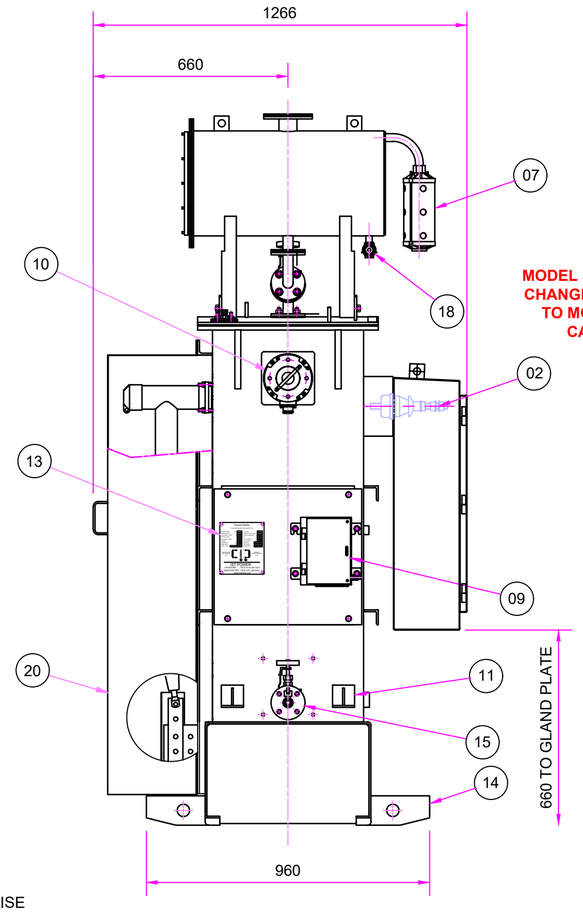
kVA	50
VOLTS	25000 / 400
AMPS	2 / 125
VECTOR SYMBOL	SINGLE PHASE



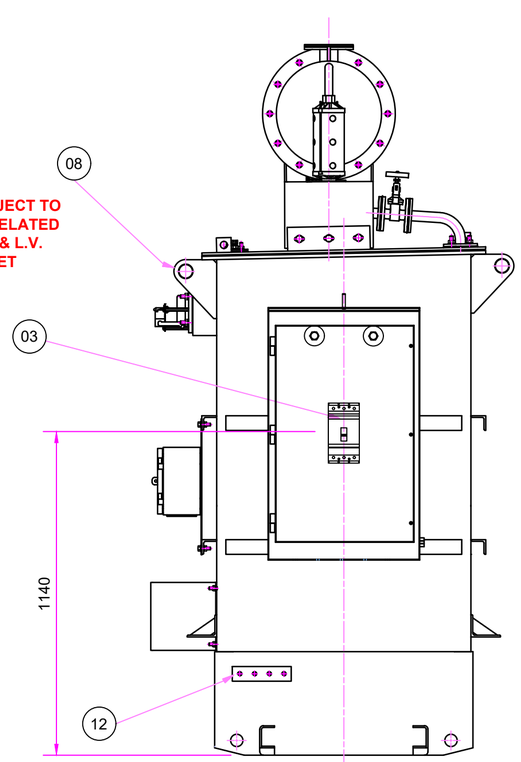


PRIMARY SIDE 25KV

LABEL ON SHIELD
" DANGER DO NOT ENGERNISE
IF THIS EARTH IS REMOVED "

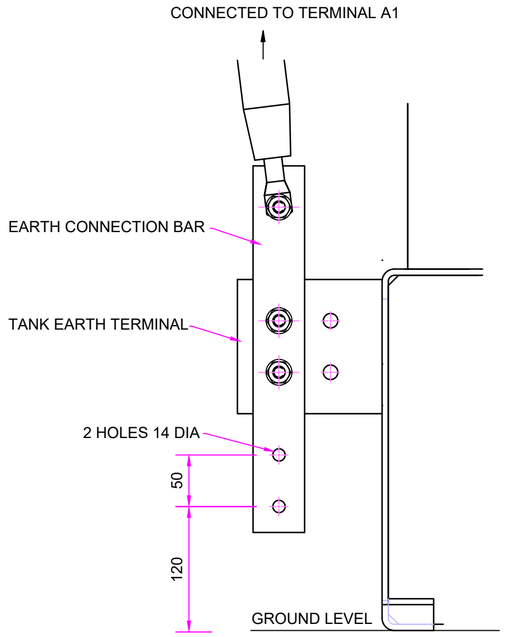


MODEL SUBJECT TO CHANGES RELATED TO MCCB & L.V. CABINET



SECONDARY SIDE 400V

NOTE : CABINET DOOR NOT SHOWN IN THIS VIEW



EARTH CONNECTION DETAIL

PAINT SPEC:-
NETWORK RAIL SPEC.RT/CE/S/039 (RT98)
PROTECTIVE TREATMENT FOR RAILTRACK INFRASTUCTURE REFERANCE N1.
FINISH : (FINAL COLOUR)
STANDARD COLOUR : SEMI-GLOSS LIGHT GREY (GOOSE GREY)
TO BS4800 REFS 00A05
UNLESS SPECIFIED ALTERNATIVELY

WHERE USED 0105517

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

A2 420 x 594

ISSUE	BY	ECN	DESCRIPTION	DATE
0			NEW	
1	R.L.	M1793	CHANGED FUSE SWITCH TO MCCB. CUSTOMER REQUEST.	09/09/2021
2	R.L.	M1939	SEE ECN	04/11/2021
3	R.L.	M1940	UPDATED POSITION & MODEL OF 160A MCCB.	04/11/2021
4				
5				
6				
7				
8				

TITLE

OUTLINE OF 50kVA 25kV 400V
SINGLE PHASE TRANSFORMER
GROUND MOUNTED

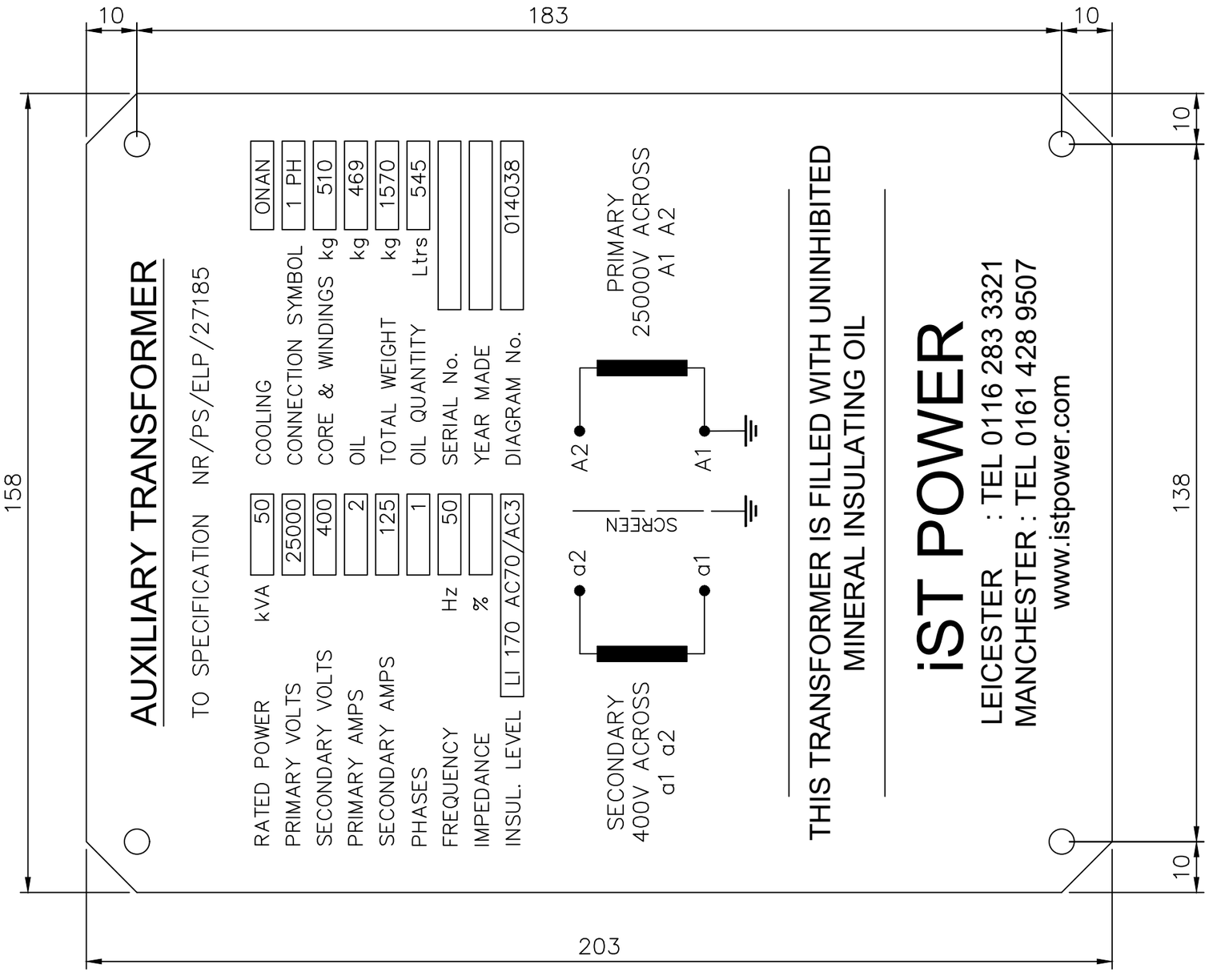
IST POWER PRODUCTS LIMITED
LEICESTER : 0116 283 3321
MANCHESTER : 0161 428 9507

DRAWN BY	CHECKED	SCALE	DATE
R.LOBO	P.W.J.	1:15	09/09/2021

DRAWING No. 013794

SHEET No. 1 OF 1

IF IN DOUBT ASK



WHERE USED 0105517

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	R.L.	M2092	CORRECTED DIAGRAM NUMBER ON RATING PLATE	16/05/22

TITLE

RATING AND DIAGRAM PLATE

IST POWER PRODUCTS LTD
LEICESTER : 0116 2833321
MANCHESTER : 0161 428 9507

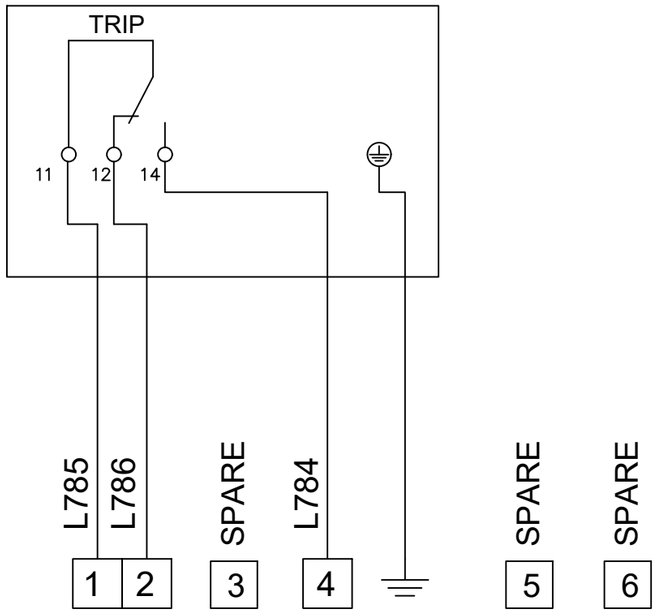
DRAWN	CHECKED	SCALE	DATE
R.LOBO	P.W.J.	1:1	03/11/2021

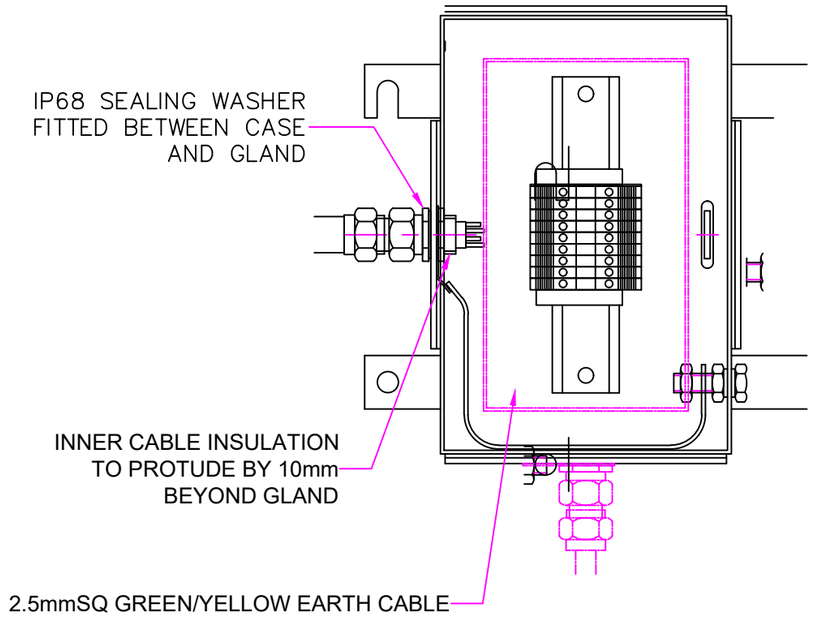
DRAWING No. 014038

SHEET No. 1

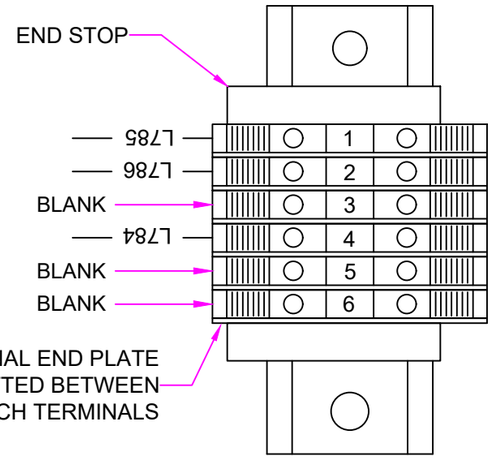
IF IN DOUBT ASK

PRESSURE RELIEF DEVICE





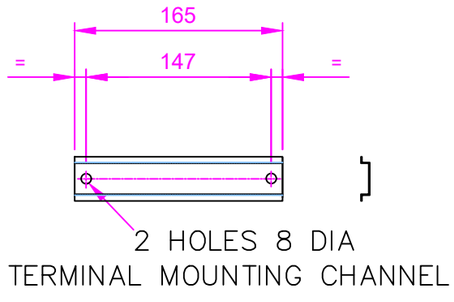
NOTE : WIRE NUMBERS/FERRULES ARE FROM THE TERMINALS OUTWARDS



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

AUXILIARIES WIRING: 2.5mmSQ PVC SWA CABLE

INSTRUMENT	CONTACTS	OPERATION	COMMENTS
PRESSURE RELIEF DEVICE	1 N.O 1 N.C	CLOSES ON EXCESS PRESSURE OPENS ON EXCESS PRESSURE	RELEASE AT 5.8 P.S.I.



WHERE USED 0105517

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	R.L.	M2026	LABELS FOR TERMINALS 3 AND 4 FOR P.R.D. WERE INCORRECT,	23/02/22

TITLE

AUXILIARY WIRING DIAGRAM

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

DRAWN	CHECKED	SCALE	DATE
R.LOBO	P.W.J.	NTS	22/02/2022

DRAWING No. 014405

SHEET No. 1

SECTION
7

APPENDIX A

COOLING LIQUID:
NYNAS NITRO LIBRA

(PRODUCT DATA SHEET - 2 PAGES)
(SAFETY DATA SHEET – 22 PAGES)

STANDARD GRADE

Nytro Libra

Electrical insulating oil

Nytro Libra is an uninhibited transformer oil that conforms to IEC 60296 Edition 4.0. Developed and formulated to deliver solid resistance to oil degradation, Nytro Libra provides good oxidation stability thanks to its natural inhibitors. This increases the possibilities for a longer transformer life with less maintenance.

Designed for heavy duty

This product has been specially developed for use in oil-filled electrical equipment – including power and distribution transformers, rectifiers, circuit breakers and switchgears.

Performance and benefits

Good heat transfer. Thanks to low viscosity and viscosity index, this standard grade offers extremely good heat transfer characteristics, ensuring heat is efficiently removed from core and windings.

Reliable oxidation stability. Developed and formulated to deliver good resistance to oil degradation, this grade also provides good oxidation stability for enhanced transformer life and minimum maintenance.

Very good low temperature properties. Naphthenic characteristics allow the transformer to start at the lowest possible temperature – without using pour point depressants.

High dielectric strength. This insulating oil both meets and exceeds the toughest demands on dielectric strength – when stored and handled correctly.

Product description

Nytro Libra fulfils the requirements for IEC 60296 Edition 4.0 uninhibited oil. Nynas classify this product as a standard grade.

Nytro Libra is rigorously analysed and passes the following corrosion tests:
- ASTM D1275
- IEC 62535
- DIN 51353

In accordance with IEC 60296 Edition 4.0, all additives are declared.

There’s more to us than this

We’re delighted you chose one of our transformer oils. If you have any questions about other products and services, get in touch with your local Nynas contact. Besides top quality oils, we offer a wide range of services, including rapid delivery worldwide, sample analysis, training, seminars and much more. All you have to do is ask. Find out more at www.nynas.com

PRODUCT DATA SHEET

Nytro Libra

PROPERTY	UNIT	TEST METHOD	SPECIFICATION LIMITS		TYPICAL DATA
			MIN	MAX	
1 - Function					
Viscosity, 40°C	mm^2/s	ISO 3104		12.0	9.4
Viscosity, -30°C	mm^2/s	ISO 3104		1800	1050
Pour point	°C	ISO 3016		-40	-51
Water content	mg/kg	IEC 60814		30	<20
Breakdown voltage					
- Before treatment	kV	IEC 60156	30		40-60
- After treatment	kV	IEC 60296	70		>70
Density, 20°C	kg/dm^3	ISO 12185		0.895	0.876
DDF at 90°C		IEC 60247		0.005	<0.001
2 - Refining/stability					
Appearance		IEC 60296	Clear, free from sediment		complies
Acidity	mg KOH/g	IEC 62021		0.01	<0.01
Interfacial tension	mN/m	EN 14210	40		47
Corrosive sulphur		DIN 51353	non-corrosive		non-corrosive
Potentially corrosive sulphur		IEC 62535	non-corrosive		non-corrosive
Corrosive sulphur		ASTM D 1275	non-corrosive		non-corrosive
DBDS	mg/kg	IEC 62697-1		not detectable	not detectable
Antioxidant	wt %	IEC 60666		not detectable	not detectable
Metal passivator additives	mg/kg	IEC 60666		not detectable	not detectable
2-Furfural and related compounds content	mg/kg	IEC 61198		0.05	<0.05
Aromatic content	%	IEC 60590			9
3 - Performance					
Oxidation stability at 120°C,164 h		IEC 61125 C			
Total acidity	mg KOH/g			1.2	0.65
Sludge	wt %			0.8	0.16
DDF at 90°C				0.500	0.070
4 - Health, safety and environment (HSE)					
Flash point, PM	°C	ISO 2719	135		150
PCA	wt %	IP 346		3	<3
PCB		IEC 61619	not detectable		not detectable

Nytro Libra is an uninhibited insulating oil, meeting IEC 60296 Ed.4 (2012) General specifications. Breakdown voltage after treatment as per definition given in IEC 60296, section 6.4.

Severely Hydrotreated Insulating Oil
Issuing date: 2017-10-11

NYTRO® LIBRA

SAFETY DATA SHEET

Date of printing	2019-10-21
Date of issue/ Date of revision	2019-10-21
Date of previous issue	2018-11-07
Version	5

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

1.1 Product identifier

Product name	NYTRO® LIBRA
Product description	Insulating oil
Product type	Liquid.

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

Identified uses
Distribution of substance - Industrial Formulation and (re)packing of substances and mixtures - Industrial Use in functional fluids - Industrial Use in functional fluids - Professional

Uses advised against	**Reason**
This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the supplier.	-

1.3 Details of the supplier of the safety data sheet

Supplier/Manufacturer	Head office: Nynas AB P.O. Box 10700 SE-121 29 Stockholm SWEDEN +46 8 602 12 00 (Office hours 8 am - 4.30 pm (CET)) www.nynas.com
e-mail address of person responsible for this SDS	ProductHSE@nynas.com

1.4 Emergency telephone number

Telephone number	+44 (0) 1235 239 670
Hours of operation	24 hour service

National advisory body/Poison Centre

Telephone number 020 - 99 60 00 (Kemiakuten, 24h service)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition: Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Asp. Tox. 1, H304

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

SECTION 2: Hazards identification

2.2 Label elements

Hazard pictograms

Signal word	Danger
Hazard statements	H304 - May be fatal if swallowed and enters airways.
Precautionary statements	
Prevention	Not applicable.
Response	P301 + P310 + P331 - IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting.
Storage	P405 - Store locked up.
Disposal	P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.
Supplemental label elements	Not applicable.
Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles	Not applicable.

2.3 Other hazards

Product meets the criteria for PBT or vPvB according to Regulation (EC) No. 1907/2006, Annex XIII	This mixture does not contain any substances that are assessed to be a PBT or a vPvB.
Other hazards which do not result in classification	Prolonged or repeated contact may dry skin and cause irritation.

SECTION 3: Composition/information on ingredients

3.2 Mixtures Mixture

Product/ingredient name	Identifiers	%	Regulation (EC) No. 1272/2008 [CLP]	Type
Distillates (petroleum), hydrotreated light naphthenic	REACH #: 01-2119480375-34 EC: 265-156-6 CAS: 64742-53-6 Index: 649-466-00-2	50 - 70	Asp. Tox. 1, H304	[1] [2]
Distillates (petroleum), hydrotreated light paraffinic	REACH #: 01-2119487077-29 EC: 265-158-7 CAS: 64742-55-8	0 - 50	Asp. Tox. 1, H304	[1] [2]
Distillates (petroleum), hydrotreated heavy paraffinic	REACH #: 01-2119484627-25 EC: 265-157-1 CAS: 64742-54-7 Index: 649-467-00-8	0 - 50	Not classified.	[2]
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	REACH #: 01-2119474878-16 EC: 276-737-9 CAS: 72623-86-0 Index: 649-482-00-X	0 - 50	Asp. Tox. 1, H304	[1] [2]
Distillates (petroleum), solvent-refined heavy naphthenic	REACH #: 01-2119483621-38	0 - 5	Not classified.	[2]

SECTION 3: Composition/information on ingredients

	EC: 265-097-6 CAS: 64741-96-4 Index: 649-457-00-3		**See Section 16 for the full text of the H statements declared above.**	

Regulation (EC) No. 1272/2008 [CLP] Annex VI Nota L applies to the base oil(s) in this product. Nota L - The classification as a carcinogen need not apply if it can be shown that the substance contains less than 3 % DMSO extract as measured by IP 346.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs, vPvBs or Substances of equivalent concern, or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit
[3] Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII
[4] Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII
[5] Substance of equivalent concern
[6] Additional disclosure due to company policy

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation, blurred vision or swelling occurs and persists, obtain medical advice from a specialist.
Inhalation	If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. If casualty is unconscious and: If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Get medical attention if adverse health effects persist or are severe. Maintain an open airway.
Skin contact	Wash with soap and water. Remove contaminated clothing and shoes. Handle with care and dispose of in a safe manner. Seek medical attention if skin irritation, swelling or redness develops and persists. Accidental high pressure injection through the skin requires immediate medical attention. Do not wait for symptoms to develop.
Ingestion	Always assume that aspiration has occurred. Do not induce vomiting. Can enter lungs and cause damage. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Seek professional medical attention or send the casualty to a hospital. Do not wait for symptoms to develop. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Before attempting to rescue casualties, isolate area from all potential sources of ignition including disconnecting electrical supply. Ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry into confined spaces.

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

Eye contact	Slight irritant

SECTION 4: First aid measures

Inhalation	Inhalation of oil mist or vapours at elevated temperatures may cause respiratory irritation.
Skin contact	Adverse symptoms may include the following: irritation dryness cracking
Ingestion	Adverse symptoms may include the following: Nausea or vomiting. diarrhoea

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician	Due to low viscosity there is a risk of aspiration if the product enters the lungs. Treat symptomatically.
Specific treatments	Always assume that aspiration has occurred.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media	Use dry chemical, CO_2, water spray (fog) or foam.
Unsuitable extinguishing media	Do not use direct water jets on the burning product; they could cause splattering and spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture	In a fire or if heated, a pressure increase will occur and the container may burst. This substance will float and can be reignited on surface water.
Hazardous combustion products	Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide, H2S, SOx (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

5.3 Advice for firefighters

Special precautions for fire-fighters	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Special protective equipment for fire-fighters	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	Avoid breathing vapour or mist. Keep non-involved personnel away from the area of spillage. Alert emergency personnel. Except in case of small spillages, the feasibility of any actions should always be assessed and advised, if possible, by a trained, competent person in charge of managing the emergency. Stop leak if safe to do so. Avoid direct contact with the product. Stay upwind/keep distance from source. In case of large spillages, alert occupants in downwind areas. Eliminate all ignition sources if safe to do so. Spillages of limited amounts of product, especially in the open air when vapours will be usually quickly dispersed, are dynamic situations, which will presumably limit the exposure to dangerous concentrations. Note : recommended measures are based on the most likely spillage scenarios for this material; however, local conditions (wind, air temperature, wave/current direction and speed) may significantly influence the choice of appropriate actions. For this

SECTION 6: Accidental release measures

reason, local experts should be consulted when necessary. Local regulations may also prescribe or limit actions to be taken.

For emergency responders

Small spillages: normal antistatic working clothes are usually adequate.

Large spillages: full body suit of chemically resistant and thermal resistant material should be used. Work gloves providing adequate chemical resistance, specifically to aromatic hydrocarbons. Note : gloves made of PVA are not water-resistant, and are not suitable for emergency use. Safety helmet, antistatic non-skid safety shoes or boots. Goggles and /or face shield, if splashes or contact with eyes is possible or anticipated.

Respiratory protection : A half or full-face respirator with filter(s) for organic vapours (and when applicable for H2S) a Self Contained Breathing Apparatus (SCBA) can be used according to the extent of spill and predictable amount of exposure. If the situation cannot be completely assessed, or if an oxygen deficiency is possible, only SCBA's should be used.

6.2 Environmental precautions

Prevent product from entering sewers, rivers or other bodies of water. If necessary dike the product with dry earth, sand or similar non-combustible materials. In case of soil contamination, remove contaminated soil and treat in accordance with local regulations.

In case of small spillages in closed waters (i.e. ports), contain product with floating barriers or other equipment. Collect spilled product by absorbing with specific floating absorbents.

If possible, large spillages in open waters should be contained with floating barriers or other mechanical means. If this is not possible, control the spreading of the spillage, and collect the product by skimming or other suitable mechanical means. The use of dispersants should be advised by an expert, and, if required, approved by local authorities.

6.3 Methods and material for containment and cleaning up

Small spill

Stop leak if without risk. Absorb spilled product with suitable non-combustible materials.

Large spill

Large spillages may be cautiously covered with foam, if available, to limit vapour cloud formation. Do not use water jet. When inside buildings or confined spaces, ensure adequate ventilation. Transfer collected product and other contaminated materials to suitable containers for recovery or safe disposal. Approach the release from upwind. Contaminated absorbent material may pose the same hazard as the spilt product.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

General information

Obtain special instructions before use. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Use and store only outdoors or in a well-ventilated area. Hazard of slipping on spilt product. Avoid release to the environment.

7.1 Precautions for safe handling

Protective measures

Do not ingest. Do not breathe dust/fume/gas/mist/vapours/spray. Avoid contact with eyes, skin and clothing. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use.

Prevent the risk of slipping. Take precautionary measures against static discharge. Avoid splash filling of bulk volumes when handling hot liquid product. Empty containers retain product residue and can be hazardous.

SECTION 7: Handling and storage

	Nota : See Section 8 for information on appropriate personal protective equipment. See section 13 for waste disposal information.
Advice on general occupational hygiene	Ensure that proper housekeeping measures are in place. Contaminated materials should not be allowed to accumulate in the workplaces and should never be kept inside the pockets. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash hands thoroughly after handling. Change contaminated clothes at the end of working shift. See also Section 8 for additional information on hygiene measures.
7.2 Conditions for safe storage, including any incompatibilities	Storage area layout, tank design, equipment and operating procedures must comply with the relevant regional, national or local legislation. Storage installations should be designed with adequate bunds in case of leaks or spills. Cleaning, inspection and maintenance of internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations. Store separately from oxidising agents. Recommended materials for containers, or container linings use mild steel, stainless steel. Not suitable : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Compatibility should be checked with the manufacturer. Keep only in the original container or in a suitable container for this kind of product. Keep container tightly closed and sealed until ready for use. Do not store in unlabelled containers. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Empty containers may contain harmful, flammable/combustible or explosive residue or vapours. Do not cut, grind, drill, weld, reuse or dispose of containers unless adequate precautions are taken against these hazards. Store locked up. Protect from sunlight.

7.3 Specific end use(s)

Recommendations	Not available.
Industrial sector specific solutions	Not available.

SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
Distillates (petroleum), hydrotreated light naphthenic	**Work environment authority Regulation 2018:1 (Sweden, 2/2018).** TWA: 1 mg/m³ 8 hours. Form: mist and fume STEL: 3 mg/m³ 15 minutes. Form: mist and fume
Distillates (petroleum), hydrotreated light paraffinic	**Work environment authority Regulation 2018:1 (Sweden, 2/2018).** TWA: 1 mg/m³ 8 hours. Form: mist and fume STEL: 3 mg/m³ 15 minutes. Form: mist and fume
Distillates (petroleum), hydrotreated heavy paraffinic	**Work environment authority Regulation 2018:1 (Sweden, 2/2018).** TWA: 1 mg/m³ 8 hours. Form: mist and fume STEL: 3 mg/m³ 15 minutes. Form: mist and fume
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	**Work environment authority Regulation 2018:1 (Sweden, 2/2018).**

SECTION 8: Exposure controls/personal protection

	TWA: 1 mg/m³ 8 hours. Form: mist and fume STEL: 3 mg/m³ 15 minutes. Form: mist and fume
Distillates (petroleum), solvent-refined heavy naphthenic	**Work environment authority Regulation 2018:1 (Sweden, 2/2018).** TWA: 1 mg/m³ 8 hours. Form: mist and fume STEL: 3 mg/m³ 15 minutes. Form: mist and fume
Oil mist	***[Air contaminant]*** **Work environment authority Regulation 2018:1 (Sweden, 2/2018).** TWA: 1 mg/m³ 8 hours. Form: mist and fume STEL: 3 mg/m³ 15 minutes. Form: mist and fume

Recommended monitoring procedures: If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
Distillate (petroleum), hydrotreated light naphthenic	DNEL	Long term Inhalation	5,58 mg/m³	Workers	Local
Distillates (petroleum), hydrotreated light paraffinic	DNEL	Long term Inhalation	5,58 mg/m³	Workers	Local
Distillate (petroleum), hydrotreated heavy paraffinic	DNEL	Long term Inhalation	5,58 mg/m³	Workers	Local
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	DNEL	Long term Inhalation	5,58 mg/m³	Workers	Local

PNECs

No PNECs available

PNEC Summary: Hydrocarbon Block Method (Petrorisk)

8.2 Exposure controls

Appropriate engineering controls: Mechanical ventilation and local exhaust will reduce exposure via the air. Use oil resistant material in construction of handling equipment. Store under recommended conditions and if heated, temperature control equipment should be used to avoid overheating.

Individual protection measures

Hygiene measures: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Wash contaminated clothing before reuse.

Eye/face protection: Recommended: Safety glasses with side shields.

Skin protection

Hand protection: 4 - 8 hours (breakthrough time): nitrile rubber

Body protection: Wear protective clothing if there is a risk of skin contact. Change contaminated clothes at the end of working shift.

Other skin protection: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

SECTION 8: Exposure controls/personal protection

Respiratory protection	Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary.
Environmental exposure controls	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	Liquid.
Colour	Light yellow
Odour	Odourless/Light petroleum.
Odour threshold	Not available.
pH	Not applicable.
Melting point/freezing point	-51°C
Initial boiling point and boiling range	Not available.
Flash point	Closed cup: >140°C [Pensky-Martens.]
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	Not available.
Vapour pressure (Calculated)	<0,01 kPa [room temperature]
Density	0,88 g/cm³ [15°C]
Solubility(ies)	Insoluble in water.
Partition coefficient: n-octanol/ water	Not available.
Auto-ignition temperature	>200°C
Decomposition temperature	>280°C
Viscosity	Kinematic (40°C): 0,096 cm^2/s (9,6 cSt)
Explosive properties	Not available.
Oxidising properties	Not available.
DMSO extractable compounds for base oil substance(s) according to IP346	< 3%

SECTION 10: Stability and reactivity

10.1 Reactivity	No specific test data related to reactivity available for this product or its ingredients.
10.2 Chemical stability	Stable under normal conditions.
10.3 Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
10.4 Conditions to avoid	Keep away from extreme heat and oxidizing agents. Take precautionary measures against static discharge.
10.5 Incompatible materials	Oxidizing agent

SECTION 10: Stability and reactivity

10.6 Hazardous decomposition products	Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide, H2S, SOx (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure	Remarks
Distillates (petroleum), hydrotreated light naphthenic	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours	EMBSI 1988 (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1982(similar material)
Distillates (petroleum), hydrotreated light paraffinic	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours	EMBSI 1988 (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1982(similar material)
Distillates (petroleum), hydrotreated heavy paraffinic	LC50 Inhalation Dusts and mists	Rat	>5,53 mg/l	4 hours	EMBSI 1988 (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1982 (similar material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	LC50 Inhalation Dusts and mists	Rat - Male, Female	>5,53 mg/l	4 hours	EMBSI 1988 (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1982(similar material)

Conclusion/Summary: Based on available data, the classification criteria are not met.

Acute toxicity estimates

N/A

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Observation	Remarks
Distillates (petroleum), hydrotreated light naphthenic	Skin - Non-irritant to skin.	Rabbit	0 to 1	24 to 72 hours	API 1982(similar material)
	Eyes - Non-irritating to the eyes.	Rabbit	0 to 0,11	24 to 72 hours	API 1982(similar material)
Distillates (petroleum), hydrotreated light paraffinic	Skin - Non-irritant to skin.	Rabbit	0 to 1	24 to 72 hours	API 1982(similar material)
	Eyes - Non-irritating to the eyes.	Rabbit	0 to 0,11	24 to 72 hours	API 1982(similar material)
Distillates (petroleum), hydrotreated heavy paraffinic	Skin - Non-irritant to skin.	Rabbit	0 to 1	24 to 72 hours	API 1982 (similar material)
	Eyes - Non-irritating to the	Rabbit	0 to 0,11	24 to 72	API 1982 (similar

SECTION 11: Toxicological information

	eyes.			hours	material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Skin - Non-irritant to skin.	Rabbit	0 to 1	24 to 72 hours	API 1982 (similar material)
	Eyes - Non-irritating to the eyes.	Rabbit	0 to 0,11	24 to 72 hours	API 1982(similar material)

Skin — Based on available data, the classification criteria are not met.

Eyes — Based on available data, the classification criteria are not met.

Respiratory — Based on available data, the classification criteria are not met.

Sensitisation

Product/ingredient name	Route of exposure	Species	Result	Remarks
Distillates (petroleum), hydrotreated light naphthenic	skin	Guinea pig	Not sensitizing	API 1982(similar material)
Distillates (petroleum), hydrotreated light paraffinic	skin	Guinea pig	Not sensitizing	API 1982(similar material)
Distillates (petroleum), hydrotreated heavy paraffinic	skin	Guinea pig	Not sensitizing	API 1982 (similar material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	skin	Guinea pig	Not sensitizing	UBTL 1984j,k,l (similar material)

Skin — Based on available data, the classification criteria are not met.

Respiratory — Based on available data, the classification criteria are not met.

Mutagenicity

Conclusion/Summary — Based on available data, the classification criteria are not met.

Carcinogenicity

Conclusion/Summary — The base oil(s) in this product is based on an severely hydrotreated distillate. The product should not be regarded as a carcinogen.

Reproductive toxicity

Conclusion/Summary — Based on available data, the classification criteria are not met.

Teratogenicity

Conclusion/Summary — Based on available data, the classification criteria are not met.

Aspiration hazard

Product/ingredient name	Result
Distillates (petroleum), hydrotreated light naphthenic	ASPIRATION HAZARD - Category 1
Distillates (petroleum), hydrotreated light paraffinic	ASPIRATION HAZARD - Category 1
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	ASPIRATION HAZARD - Category 1

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure
Distillate (petroleum), hydrotreated light naphthenic	Sub-chronic LOAEL Oral	Rat	125 mg/kg	-
	Sub-chronic NOAEL Dermal	Rat	>2000 mg/kg	-
	Sub-acute NOEL Inhalation Dusts and mists	Rat	220 mg/m³	6 hours; 5 days per week
Distillates (petroleum), hydrotreated light paraffinic	Sub-chronic LOAEL Oral	Rat	125 mg/kg	-
	Sub-chronic NOAEL Dermal	Rat	>2000 mg/kg	-
	Sub-acute NOEL Inhalation Dusts and mists	Rat	220 mg/m³	6 hours; 5 days per week

SECTION 11: Toxicological information

Distillate (petroleum), hydrotreated heavy paraffinic	Sub-chronic LOAEL Oral	Rat	125 mg/kg	-
	Sub-chronic NOAEL Dermal	Rat	>2000 mg/kg	-
	Sub-acute NOEL Inhalation Dusts and mists	Rat	220 mg/m³	6 hours; 5 days per week
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Sub-chronic LOAEL Oral	Rabbit	125 mg/kg	-
	Sub-chronic NOAEL Dermal	Rat	>2000 mg/kg	-
	Sub-chronic NOEL Inhalation Dusts and mists	Rat	220 mg/m³	6 hours; 5 days per week

Specific hazard

Aspiration hazard
Aspiration means the entry of a liquid substance directly into the trachea and lower respiratory tract.
Aspiration of hydrocarbon substances can result in in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death.
This property relates to the potential for low viscosity material to spread quickly into the deep lung and cause severe pulmonary tissue damage.
Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
Distillates (petroleum), hydrotreated light naphthenic	Acute EL50 >10000 mg/l	Daphnia	48 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l Fresh water	Daphnia	21 days
Distillates (petroleum), hydrotreated light paraffinic	Acute EL50 >10000 mg/l	Daphnia	48 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l Fresh water	Daphnia	21 days
Distillates (petroleum), hydrotreated heavy paraffinic	Acute EL50 >1000 mg/l	Daphnia	48 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l Fresh water	Daphnia	21 days
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Acute EL50 >10000 mg/l	Daphnia	48 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l Fresh water	Daphnia	21 days

Conclusion/Summary: Based on available data, the classification criteria are not met.

12.2 Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Distillates (petroleum), hydrotreated light naphthenic	-	-	Inherent
Distillates (petroleum), hydrotreated light paraffinic	-	-	Inherent
Distillates (petroleum), hydrotreated heavy paraffinic	-	-	Inherent
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	-	-	Inherent

Conclusion/Summary: Inherently biodegradable.

SECTION 12: Ecological information

12.3 Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Distillates (petroleum), hydrotreated light naphthenic	2 to 6	<500	low
Distillates (petroleum), hydrotreated light paraffinic	2 to 6	<500	low
Distillates (petroleum), hydrotreated heavy paraffinic	2 to 6	<500	low
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	2 to 6	<500	low

Conclusion/Summary: The product has a potential to bioaccumulate.

12.4 Mobility in soil

Mobility: High mobility in soil predicted, based on log Kow > 3.0.

12.5 Results of PBT and vPvB assessment

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

12.6 Other adverse effects: Insoluble in water. Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods

Product

Methods of disposal: Where possible (e.g. in the absence of relevant contamination), recycling of used substance is feasible and recommended. This substance can be burned or incinerated, subject to national/local authorizations, relevant contamination limits, safety regulations and air quality legislation. Contaminated or waste substance (not directly recyclable): Disposal can be carried out directly, or by delivery to qualified waste handlers. National legislation may identify a specific organization, and/or prescribe composition limits and methods for recovery or disposal.

Hazardous waste: Yes.

European waste catalogue (EWC)

Waste code	Waste designation
13 03 07*	mineral-based non-chlorinated insulating and heat transmission oils

Packaging

Methods of disposal: The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

SECTION 14: Transport information

International transport regulations

SECTION 14: Transport information

	ADR/RID	ADN	IMO/IMDG Classification	ICAO/IATA Classification
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class(es)	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.

14.6 Special precautions for user **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

14.7 MARPOL Annex 1 Oils

SECTION 15: Regulatory information

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

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

None of the components are listed.

Substances of very high concern

None of the components are listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles: Not applicable.

Other EU regulations

Industrial emissions (integrated pollution prevention and control) - Air: Not listed

Industrial emissions (integrated pollution prevention and control) - Water: Not listed

Ozone depleting substances (1005/2009/EU)

Not listed.

Prior Informed Consent (PIC) (649/2012/EU)

Not listed.

Seveso Directive

This product is not controlled under the Seveso Directive.

National inventory

Australia: All components are listed or exempted.

Canada: All components are listed or exempted.

SECTION 15: Regulatory information

China	All components are listed or exempted.
Japan	**Japan inventory (ENCS)**: Not determined. **Japan inventory (ISHL)**: All components are listed or exempted.
New Zealand	All components are listed or exempted.
Philippines	All components are listed or exempted.
Republic of Korea	All components are listed or exempted.
Taiwan	All components are listed or exempted.
United States	All components are listed or exempted.
Thailand	Not determined.
Turkey	All components are listed or exempted.
Viet Nam	Not determined.

15.2 Chemical safety assessment: Complete.

SECTION 16: Other information

Revision comments: Not available.

Indicates information that has changed from previously issued version.

Abbreviations and acronyms:

ATE = Acute Toxicity Estimate
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EUH statement = CLP-specific Hazard statement
N/A = Not available
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
SGG = Segregation Group
vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	Justification
Asp. Tox. 1, H304	Calculation method

Sweden

Full text of abbreviated H statements	H304	May be fatal if swallowed and enters airways.
Full text of classifications [CLP/GHS]	Asp. Tox. 1, H304	ASPIRATION HAZARD - Category 1

Date of printing: 2019-10-21

Date of issue/ Date of revision: 2019-10-21

Date of previous issue: 2018-11-07

Version: 5

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.
The information provided herein does not in any way constitute a product warranty, product specification, agreement on quality or similar.

Section 1 - Title

Short title of the exposure scenario	Distribution of substance - Industrial
List of use descriptors	**Identified use name:** Distribution of substance - Industrial **Process Category:** PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC09, PROC15 **Subsequent service life relevant for that use:** No. **Environmental Release Category:** ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC07, ESVOC SpERC 1.1b.v1
Environmental contributing scenarios	**Use of non-reactive processing aid at industrial site (no inclusion into or onto article) -** ERC04 **Use of reactive processing aid at industrial site (no inclusion into or onto article) -** ERC06b **Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article) -** ERC06c **Use of reactive process regulators in polymerisation processes at industrial site (inclusion or not into/onto article) -** ERC06d **Use of functional fluid at industrial site -** ERC07 **Use of intermediate -** ERC06a **Use at industrial site leading to inclusion into/onto article -** ERC05
Health Contributing scenarios	**General exposures (open systems) -** PROC04 **General exposures (closed systems) -** PROC01, PROC02, PROC03 **With sample collection -** PROC03 **Laboratory activities -** PROC15 **Bulk transfers -** PROC08b **Drum and small package filling -** PROC09 **Clean-down and maintenance of equipment -** PROC08a **Storage -** PROC01, PROC02
Industry Association	Concawe - 2017
Processes and activities covered by the exposure scenario	Bulk loading (including marine vessel/barge, rail/road car and IBC loading) of substance within closed or contained systems, including incidental exposures during its sampling, storage, unloading, maintenance and associated laboratory activities.

Section 2 - Exposure controls

2.1 Control of environmental exposure

Amounts used	Annual site tonnage (tonnes/year)28 Maximum daily site tonnage (kg/day) 1400
Frequency and duration of use	Continuous release Emission days (days per year) 20
Other conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM) 0.0001 Release fraction to wastewater from process (initial release prior to RMM) 1.0E-7 Release fraction to soil from process (initial release prior to RMM) 1.0E-5
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Risk management measures - Air	Treat air emissions. (%) 90
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.

Section 2 - Exposure controls

Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment (%) 94,2 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs (%) 94,2 Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/day) 45000 Assumed on-site sewage treatment plant flow (m^3/d) 2000

2.2 Control of worker exposure

General measures applicable to all activities

Concentration of substance in mixture or article	Covers percentage substance in the product up to 100 %.
Frequency and duration of use	Covers daily exposures up to 8 hours
Other conditions affecting workers exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes use at not more than 20°C above ambient temperature. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. 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 risk.

Risk management measures (RMM)

Clean-down and maintenance of equipment - PROC 8a
Drain down system prior to equipment break-in or maintenance.

Storage - PROC 1 & 2
Store substance within a closed system.

Section 3 - Exposure estimation and reference to its source

3.1 Environment

Exposure assessment (environment):	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model. Risk Characterisation Ratio (RCR) air 0.009 Risk Characterisation Ratio (RCR) water 0.077

3.2 Workers

Exposure assessment (human):	Qualitative approach used to conclude safe use.
Exposure estimation and reference to its source	A DNEL (derived no effect levels) cannot be derived. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. 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 risk.

Section 1 - Title

Short title of the exposure scenario	Formulation and (re)packing of substances and mixtures - Industrial
List of use descriptors	**Identified use name:** Formulation and (re)packing of substances and mixtures - Industrial **Process Category:** PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a, PROC08b, PROC09, PROC14, PROC15 **Subsequent service life relevant for that use:** No. **Environmental Release Category:** ERC02, ESVOC SpERC 2.2.v1
Environmental contributing scenarios	**Formulation into mixture -** ERC02
Health Contributing scenarios	**General exposures (open systems) -** PROC04 **General exposures (closed systems) -** PROC01, PROC02, PROC03 **Batch processes at elevated temperatures -** PROC03 **With sample collection -** PROC03 **Laboratory activities -** PROC15 **Bulk transfers -** PROC08b **Mixing operations (open systems) -** PROC05 **Transfer from/pouring from containers -** PROC08a **Drum/batch transfers -** PROC08b **Tabletting, compression, extrusion or pelletisation -** PROC14 **Drum and small package filling -** PROC09 **Clean-down and maintenance of equipment -** PROC08a **Storage -** PROC01, PROC02
Industry Association	Concawe - 2017
Processes and activities covered by the exposure scenario	Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tabletting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.

Section 2 - Exposure controls

2.1 Control of environmental exposure

Amounts used	Annual site tonnage (tonnes/year) 13000 Maximum daily site tonnage (kg/day)42000
Frequency and duration of use	Continuous release Emission days (days per year) 300
Other conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM) 0.0025 Release fraction to wastewater from process (initial release prior to RMM) 5.0E-6 Release fraction to soil from process (initial release prior to RMM) 0.0001
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Risk management measures - Water	Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%) 85,7
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.

Section 2 - Exposure controls

Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment (%) 94,2 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs (%) 94,2 Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/day) 67000 Assumed on-site sewage treatment plant flow (m^3/d) 2000

2.2 Control of worker exposure

General measures applicable to all activities

Concentration of substance in mixture or article	Covers percentage substance in the product up to 100 %.
Frequency and duration of use	Covers daily exposures up to 8 hours
Other conditions affecting workers exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes use at not more than 20°C above ambient temperature. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. 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 risk.

Risk management measures (RMM)

Clean-down and maintenance of equipment - PROC 8a
Drain down system prior to equipment break-in or maintenance.

Storage - PROC 1 & 2
Store substance within a closed system.

Section 3 - Exposure estimation and reference to its source

3.1 Environment

Exposure assessment (environment):	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model. Risk Characterisation Ratio (RCR) air 0.11 Risk Characterisation Ratio (RCR) water 0.87

3.2 Workers

Exposure assessment (human):	Qualitative approach used to conclude safe use.
Exposure estimation and reference to its source	A DNEL (derived no effect levels) cannot be derived. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. 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 risk.

Section 1 - Title

Short title of the exposure scenario	Use in functional fluids - Industrial
List of use descriptors	**Identified use name:** Use in functional fluids - Industrial **Process Category:** PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC09 **Subsequent service life relevant for that use:** No. **Environmental Release Category:** ERC07
Environmental contributing scenarios	**Use of functional fluid at industrial site -** ERC07
Health Contributing scenarios	**General exposures (closed systems) -** PROC02 **Bulk transfers -** PROC01, PROC02, PROC03 **Storage -** PROC01, PROC02 **Drum/batch transfers -** PROC08b **Filling of articles/equipment -** PROC09 **Filling of equipment from drums or containers -** PROC08a **General exposures (open systems) -** PROC04 **Remanufacture of reject articles -** PROC09
Industry Association	Concawe - 2017
Processes and activities covered by the exposure scenario	Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers.

Section 2 - Exposure controls

2.1 Control of environmental exposure

Amounts used	Annual site tonnage (tonnes/year) 10 Maximum daily site tonnage (kg/day) 500
Frequency and duration of use	Continuous release Emission days (days per year) 20
Other conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM) 0.0005 Release fraction to wastewater from process (initial release prior to RMM) 1.0E-6 Release fraction to soil from process (initial release prior to RMM) 0.001
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.
Conditions and measures related to sewage treatment plant	Estimated substance removal from wastewater via domestic sewage treatment (%) 94,2 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs (%) 94,2 Maximum allowable site tonnage (M_{Safe}) based on release following total wastewater treatment removal (kg/day) 8100 Assumed on-site sewage treatment plant flow (m^3/d) 2000

2.2 Control of worker exposure

General measures applicable to all activities

Frequency and duration of use	Covers daily exposures up to 8 hours

Section 2 - Exposure controls

Other conditions affecting workers exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes use at not more than 20°C above ambient temperature. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. 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 risk.

Risk management measures (RMM)

General exposures (open systems), Elevated temperature - PROC 04
Restrict area of openings to equipment. Provide extract ventilation to points where emissions occur. Local exhaust ventilation - efficiency of at least 90 %.

Clean-down and maintenance of equipment - PROC 8a
Drain down system prior to equipment break-in or maintenance.

Storage - PROC 1, 2
Store substance within a closed system.

Section 3 - Exposure estimation and reference to its source

3.1 Environment

Exposure assessment (environment):	Not available.

3.2 Workers

Exposure assessment (human):	Qualitative approach used to conclude safe use.
Exposure estimation and reference to its source	A DNEL (derived no effect levels) cannot be derived. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. 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 risk.

Section 1 - Title

Short title of the exposure scenario	Use in functional fluids - Professional
List of use descriptors	**Identified use name:** Use in functional fluids - Professional **Process Category:** PROC01, PROC02, PROC03, PROC08a, PROC09, PROC20 **Subsequent service life relevant for that use:** No. **Environmental Release Category:** ERC09a, ERC09b, ESVOC SpERC 9.13b.v1
Environmental contributing scenarios	**Widespread use of functional fluid (outdoor) -** ERC09b **Widespread use of functional fluid (indoor) -** ERC09a
Health Contributing scenarios	**Drum/batch transfers -** PROC08a **Transfer from/pouring from containers -** PROC09 **Operation of equipment containing engine oils and similar -** PROC01, PROC02, PROC03, PROC20 **Remanufacture of reject articles -** PROC09 **Equipment cleaning and maintenance -** PROC08a **Storage -** PROC01, PROC02
Industry Association	Concawe - 2017
Processes and activities covered by the exposure scenario	Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers.

Section 2 - Exposure controls

2.1 Control of environmental exposure

Amounts used	Annual site tonnage (tonnes/year)0,016 Maximum daily site tonnage (kg/day)0,044
Frequency and duration of use	Continuous release Emission days (days per year) 365
Other conditions affecting environmental exposure	Release fraction to air from process (initial release prior to RMM) 0.05 Release fraction to wastewater from process (initial release prior to RMM) 0.013 Release fraction to soil from process (initial release prior to RMM) 0.025
Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil	If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Risk management measures - Water	Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%) 38,5

2.2 Control of worker exposure

General measures applicable to all activities

Concentration of substance in mixture or article	Covers percentage substance in the product up to 100 %.
Frequency and duration of use	Covers daily exposures up to 8 hours
Other conditions affecting workers exposure	Assumes a good basic standard of occupational hygiene is implemented Assumes use at not more than 20°C above ambient temperature. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. 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 risk.

Risk management measures (RMM)

Section 2 - Exposure controls

Drum/batch transfers - PROC 8a
Use drum pumps.

Clean-down and maintenance of equipment - PROC 8a
Drain down system prior to equipment break-in or maintenance.

Storage - PROC 1, 2
Store substance within a closed system.

Section 3 - Exposure estimation and reference to its source

3.1 Environment

Exposure assessment (environment):	Not available.

3.2 Workers

Exposure assessment (human):	Qualitative approach used to conclude safe use.
Exposure estimation and reference to its source	A DNEL (derived no effect levels) cannot be derived. There are no routine anticipated exposures by ingestion related to any supported uses of the substance. 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 risk.

SECTION 8

APPENDIX B

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*

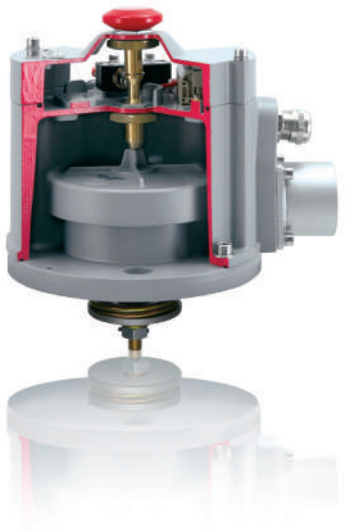
* These guideline sizes are based on experience.

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

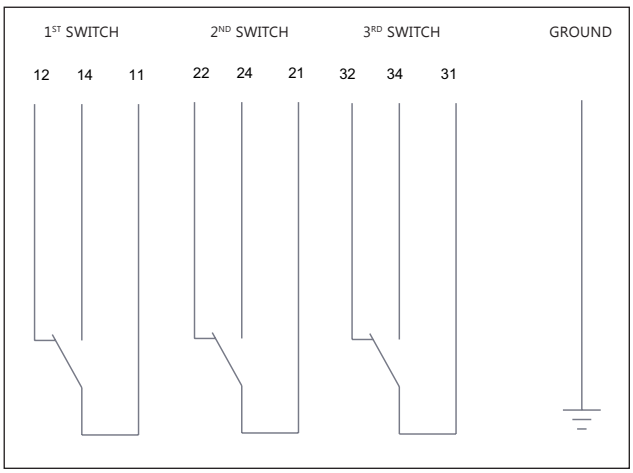
External surfaces are protected against weather corrosion. Aluminum alloy components are non-corroding and their surfaces are protected with a double layer of paint offering high level protection against all atmospheric agents and resisting temperature variations between -40 °C and +100 °C. Special painting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

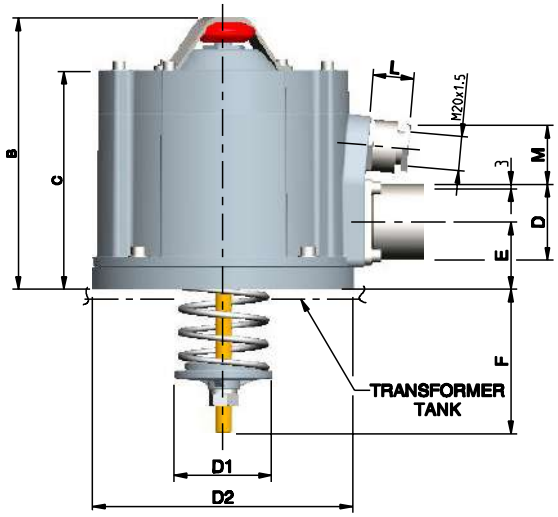
- THIRD SWITCH (terminals 32-34-31)
  change-over contact:
  – 34-31 normally open
  – 31-32 normally closed

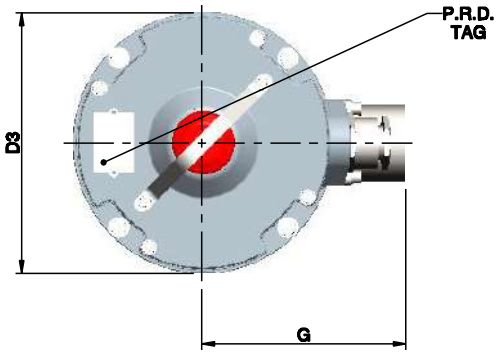


Pressure Relief Device - M

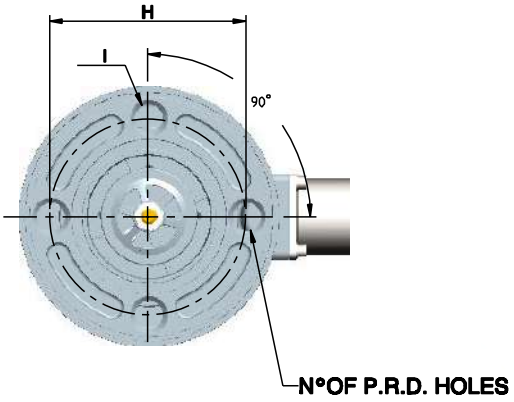
Overall dimensions

Type 50M





50M

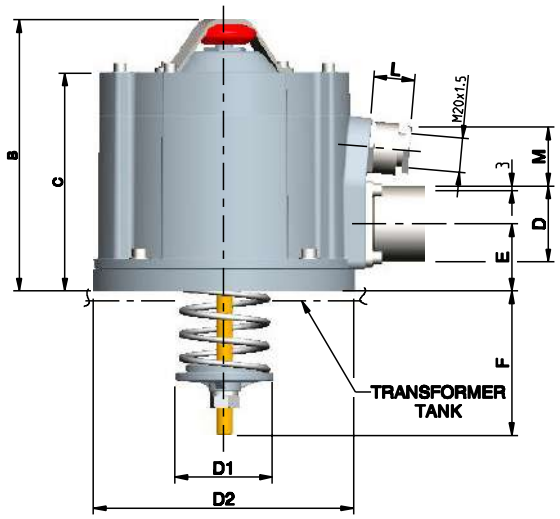


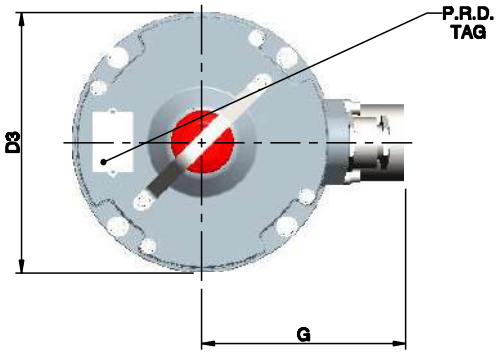
Type	B	C	D	D1	D2	D3	E	F20KPA *	F70KPA *	G	H	I	L	M	kg
50 M	170	139	Ø48.3	Ø62	Ø165	Ø166	41.5	95	60	130	Ø125	Ø18	23	38	2.1

* F = the dimension varies with set pressure

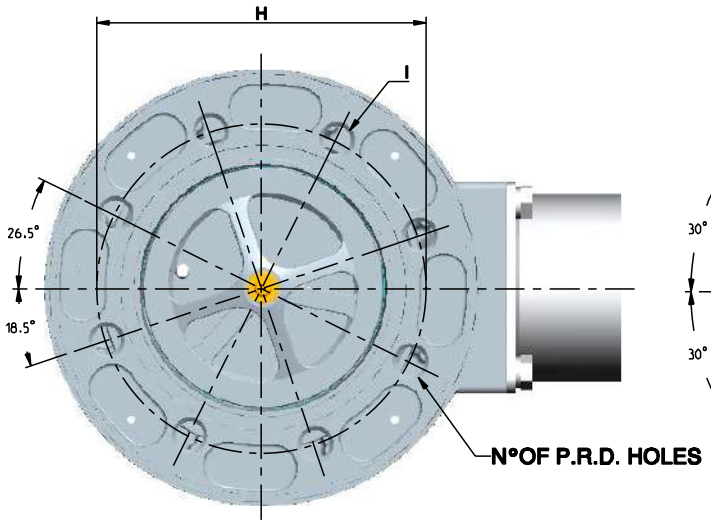
Overall dimensions

Type 125 M8 and 125 M6

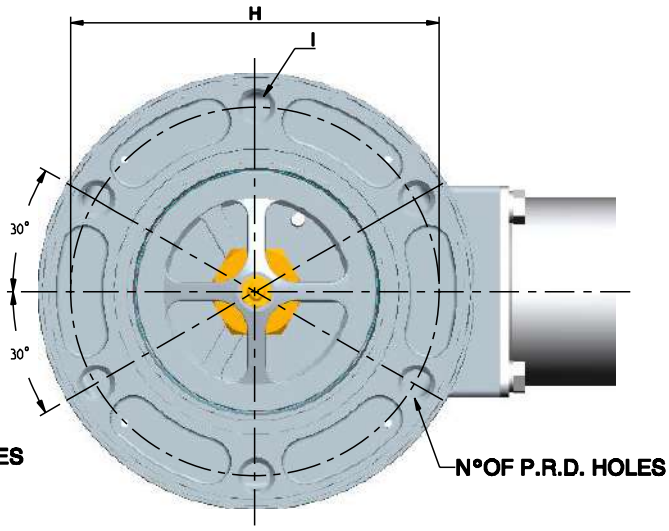




125M-8



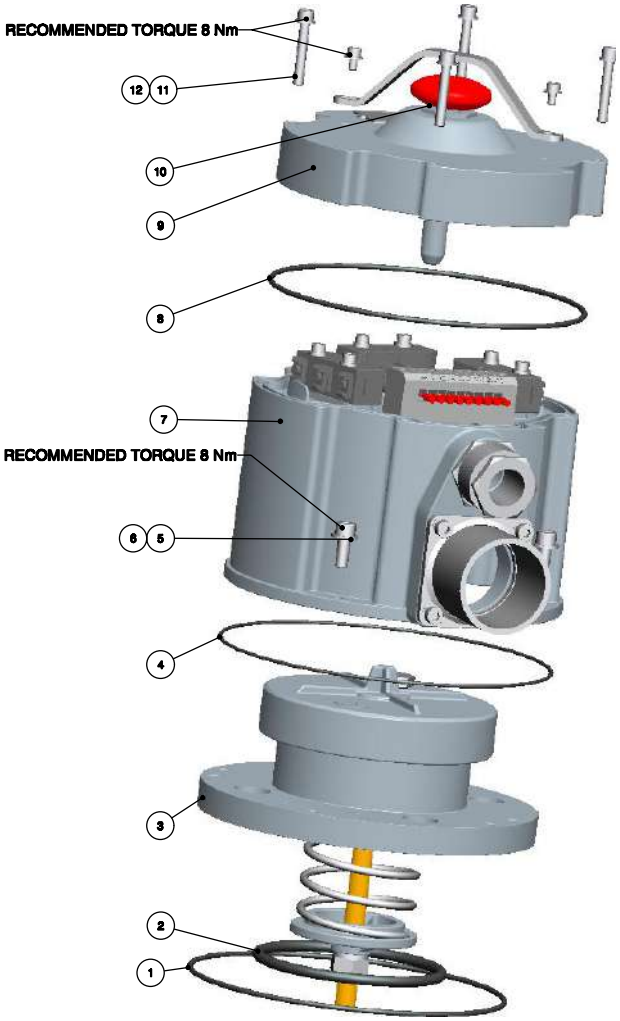
125M-6

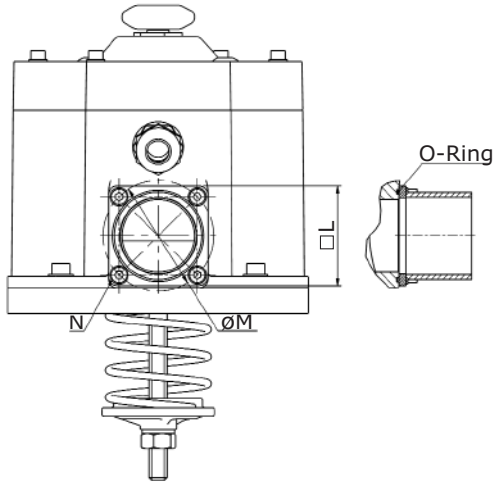


Type	B	C	D	D1	D2	D3	E	F20KPA	F70KPA	G	H	I	No. of holes
125 M-8	278	228	Ø120	Ø153	Ø278	Ø278	86	175	80	230	Ø210	Ø18	8
125 M-6	278	228	Ø120	Ø153	Ø278	Ø278	86	175	80	230	Ø235	Ø18	8

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	

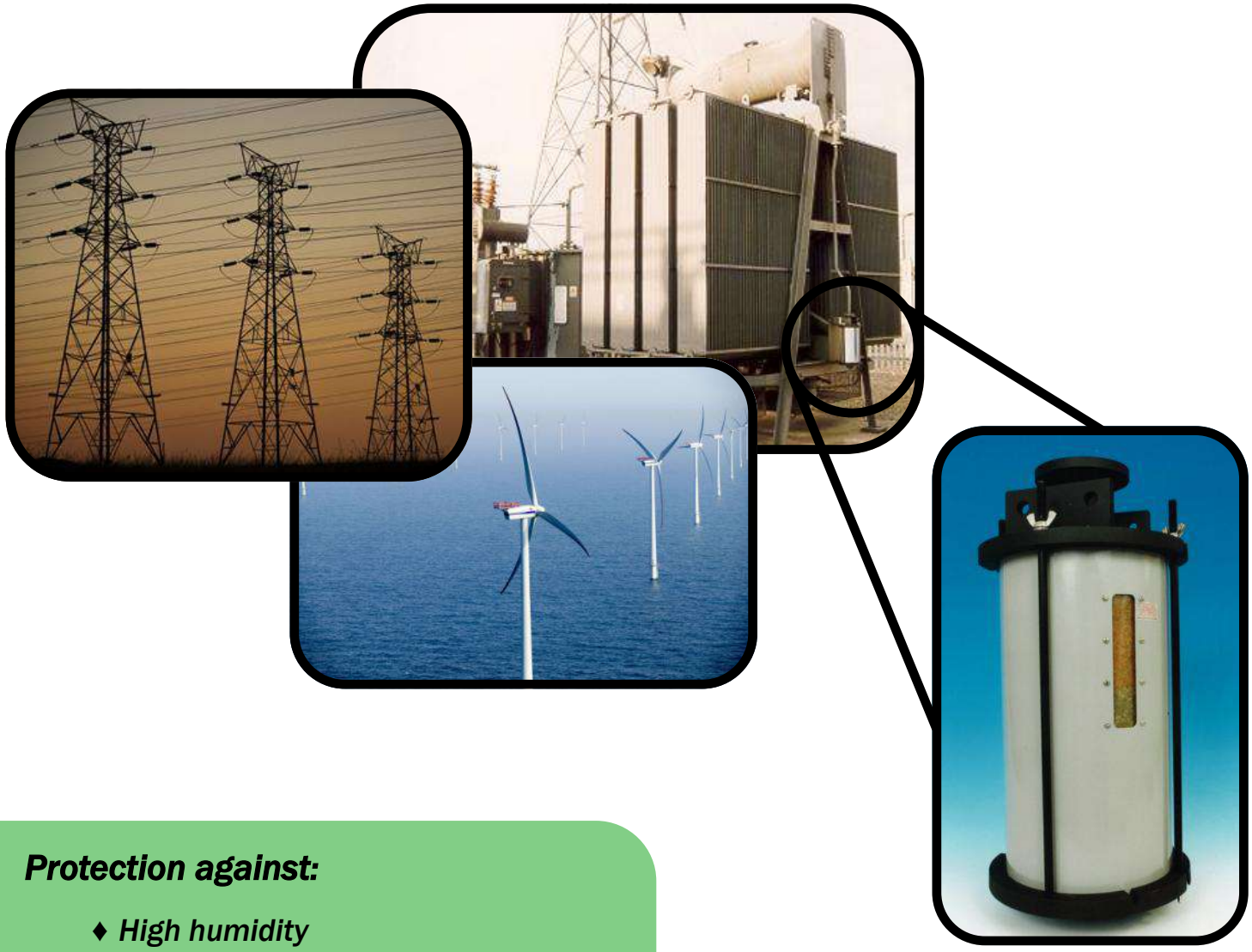
SECTION 9

DEHYDRARTING BREATHER: BROWNELL TYPE R1

(MANUFACTUR DETAILS - 5 PAGES)
(FITTING INSTRUCTIONS - 2 PAGES)
(SAFETY DATA SHEETS - 11 PAGES)

APPENDIX C

Transformer Breathers



Protection against:

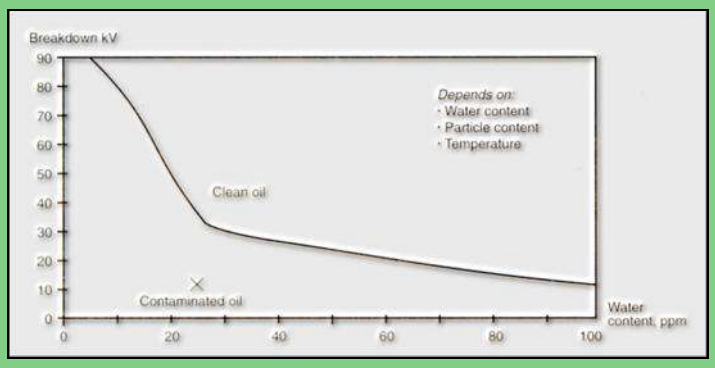
- *High humidity*
- *Water condensation*
- *Pressure variations*
- *Dielectric loss*
- *Mould growth*
- *Outgassing*

Key Technical Features

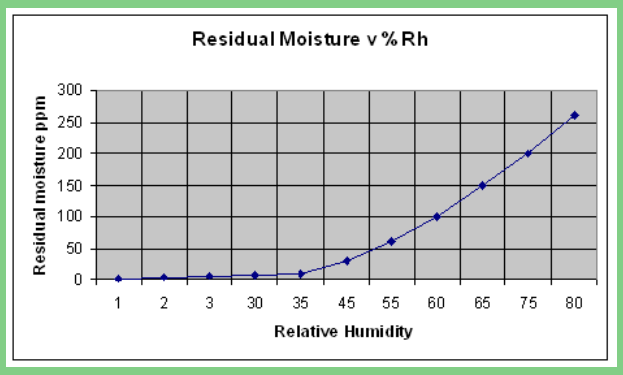
- High performance plastic or metal construction
- Simple installation
- ISO9001/2008 design approved
- Suitable for 1250 kVA to 750 mVA Transformers
- Low dusting beaded ENVIROGEL adsorbent
- Up to 25% adsorption capacity
- Definitive colour change saturation indication
- IP 65 rating
- Operating temperature range –50°C to +70°C
- Vandal proof
- Weather resistant
- All round visual saturation indicator

Size R Transformer Breather

Typical Electrical Breakdown in Transformers



The insulation value of oil can deteriorate dramatically as it becomes contaminated with water.



Water content of oil increases as it is exposed to high relative humidity

Rechargeable Transformer Breathers

V, W Transformer Breathers

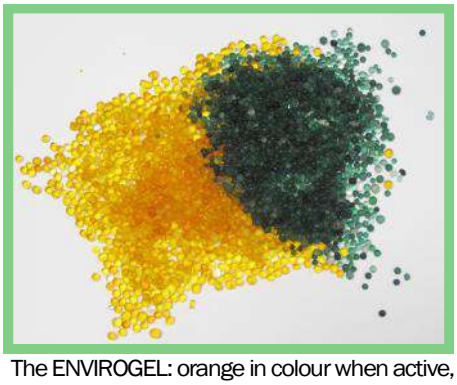
Robust construction Transformer Breathers

BROWNELL Transformer Breathers provide clear visibility of the ENVIROGEL through a shatter-proof, UV stabilised polycarbonate cylinder or window.

Two-way, low pressure valves are fitted in the base of the breather, to ensure that atmospheric air enters the desiccant charge when a negative pressure differential occurs within the transformer being protected.

BROWNELL Transformer Breathers are filled with ENVIROGEL, self-indicating desiccant.

The ENVIROGEL is orange in colour when active, turning green when saturated. This allows a visible assessment of the condition of the ENVIROGEL. Various sizes and packs of ENVIROGEL are available for refilling the Transformer Breathers.



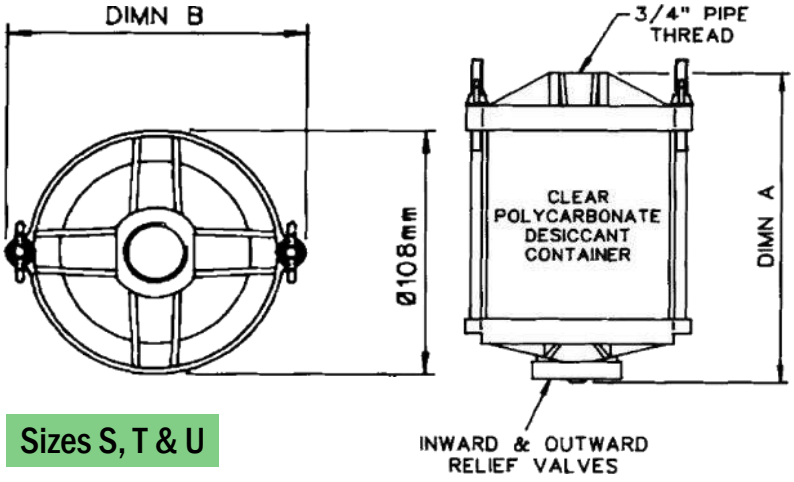
The ENVIROGEL: orange in colour when active, turning green when saturated

BROWNELL have more than 40 years experience in the design, manufacture and testing of types of humidity control equipment and moisture measuring instruments.
Please contact our Technical Services Division for further information.

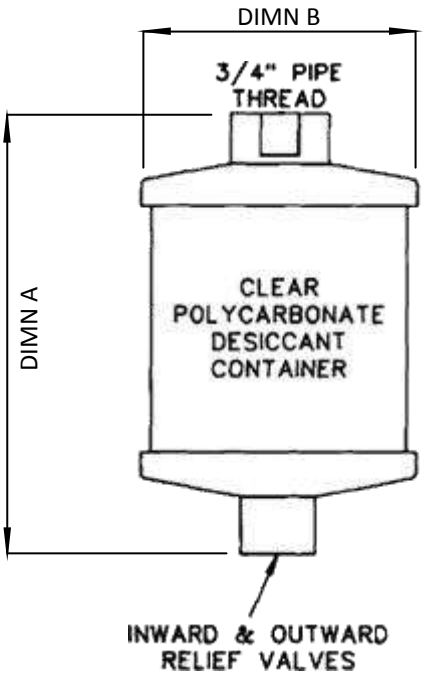
Sizes R, R1, R2, S, T & U

The top pipe connector (3/4" Female Pipe Thread) is also the filling and emptying point. The beaded, self-indicating ENVIROGEL should be replaced once the colour has changed from orange to green, as indicated on the label attached to the breather. All threads conform to BS21 and ISO7-1. Full installation and maintenance instructions are supplied with each BROWNELL Transformer Breather.

Size	Max. Oil Contents	Weight of Desiccant	Overall Length (A)	Overall Diameter (B)
R	1500 Litres	0.60 Kg	158mm	108mm
R1	3000 Litres	1.20 Kg	260mm	108mm
R2	4750 Litres	1.90 Kg	362mm	108mm
S	1130 Litres	0.45 Kg	170mm	127mm
T	2250 Litres	0.90 Kg	270mm	127mm
U	4500 Litres	1.80 Kg	470mm	127mm



Sizes S, T & U



Sizes R, R1 & R2

Quick Change

- ENVIROGEL cartridges can be refilled, replaced or reactivated
- Rapid cartridge replacement
- No special tools required
- Minimum downtime and maintenance
- Ideal for planned maintenance cycles

Transformer Breathers can be changed in a matter of minutes with Brownell's replacement cartridges. (Size W illustrated)

FAQs

Q: Can I fit a Transformer Breather, which has a larger ENVIROGEL capacity than my existing Transformer Breather?
A: Yes, for example you can use a Size R1 Transformer Breather to replace an R type which will significantly increase the time between ENVIROGEL maintenance.

Q: Are there any specific safety considerations when handling Transformer Breathers and ENVIROGEL?
A: We recommend when handling ENVIROGEL, suitable precautions are taken (as with any potentiality dust generating material) an approved respiratory mask is used.

Q: What is the recommended method for disposing of used ENVIROGEL?
A: We suggest that used ENVIROGEL is disposed of at a registered landfill site in accordance with local authority regulations.

Q: How can I reactive saturated ENVIROGEL?
A: Following the safety procedures for handling ENVIROGEL. Heating the ENVIROGEL for 3-4 hours at 95°C will recover 95% of the adsorption capacity.

INSTALLATION, OPERATING & MAINTENANCE INSTRUCTIONS

FOR BLD9662/01-3 TRANSFORMER BREATHERS

Description

The S, T & U Transformer Breathers consist of a top moulding with metal adaptor, a refillable desiccant container with stainless steel guard and a bottom moulded assembly which houses the inlet and outlet relief valve. All items are clamped together by two-threaded tie rods.

Installation

The Breather is supplied with a threaded sealing plug, which is fitted into the atmosphere air inlet on the top moulding. This is to prevent any water vapour ingress whilst in store. This plug should be removed immediately prior to the top moulding (with adaptor) being screwed to the air vent pipe of the equipment. The thread size of the metal adaptor on the top moulding of the breather is ¾ inch BSPP Female. When fitting the breather to the transformers pipe it should only be fitted by the metal adaptor, the transformer breather must not be twisted from the body or the supporting tie rods as this will damage the end mouldings.

The breather is now ready to use.

Since the change from oil seal bowls to relief valves no other work is involved in the installation as the valves prevent any water vapour ingress from the atmosphere.

Operation

Periodic inspection should be carried out to monitor the condition of the desiccant charge. The breathers are charged with ENVIROGEL desiccant. This material changes in colour from orange to green as it becomes saturated with water vapour. When the colour change reaches the indicator line on the label on the desiccant container, it should be re-charged with fresh ENVIROGEL.

Desiccant

All Brownell transformer breathers are filled with non carcinogenic silica gel called ENVIROGEL. For more information about ENVIROGEL go to www.envirogel.co.uk

Maintenance

The only maintenance necessary to keep the breather in a fully active condition is the replacement of the spent desiccant as follows:

1. Loosen the wing nuts on the tie rods until the desiccant container and guard can be removed from between the top and bottom mouldings.
2. Remove the top perforated cover and empty the spent desiccant from the container. This material may be disposed of in a normal landfill site.

3. Fill the container with active Envirogel desiccant (Refills of the correct grade and quantity are available from Brownell Limited). Lightly tap the container to settle the desiccant and top up if necessary.

4. Replace the perforated cover and refit the container between the top and bottom mouldings and guard ensuring that it is correctly fitted between the sealing gaskets.

5. Screw the wing nuts home, being careful not to over tighten as this can distort the moulding.

NOTE: If it is necessary to replace the complete desiccant container, instead of re-charging the existing unit, ensure that the self-adhesive aluminum foil vapour barriers are removed from the top and bottom of the container before installation.

DESICCANT REFILLS

	Size S	**Size T**	**Size U**
Refill Part No.	BL/D6750/01	BL/D6750/02	BL/D6750/03
Complete Desiccant Container Part No.	BL/D6437/01	BL/D6437/02	BL/D6437/03

As indicated above, individual refills containing sufficient Envirogel desiccant of the correct grade and volume are available. This method of supply is recommended to users who have a limited requirement.

As an alternative to individual refills for users who have a regular requirement, 25, 50 & 125kg sealed drums of the correct grade and size of desiccant are available.

It must be emphasised, however, that careful housekeeping is necessary when dispensing desiccant from bulk containers.

Ensure that the container is open for the minimum time necessary to remove the required quantity and that is properly sealed immediately after use.

Please contact our technical Support Division on 020 838 8408 or 020 8965 9281 for further information and guidance if required.

BROWNELL
LIMITED

Unit 2, Abbey Rd Industrial Park
Commercial Way, Park Royal
London, NW10 7XF

Tel**: 020 8965 9281** Fax: **020 8965 3239**

E-Mail: info@brownell.co.uk
Website: www.envirogel.co.uk
Website: www.tankventdryer.com

The Friendly ENVIROGEL Adsorbent

Safety Data Sheet

According to Regulation (EC) No 1907/2006 (REACH)

Trade Name: Brownell Limited
Product: Self-Indicating Silica Gel, Orange to Green
Version No: MCS/101/01/MSDS - 06 / EN

Revision Date: 03.01.2017
Print Date: 03.01.2017

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

1.1 Product identifier

Trade name or designation of the mixture	Self-Indicating Silica Gel, Orange to Green
Registered number	Not available
Synonyms Issue	Silica, amorphous, silica, precipitated and gel
Date Version	12th May 2014
Number Revision	06
Date Supersedes	03rd January 2017

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

Identified uses	Desiccant. For adsorption of moisture and prevention of corrosion and mould growth
Uses advised against	No other uses are advised

1.3 Details of the supplier of the safety data sheet

Supplier Name	Brownell Limited
Address	Unit 2, Abbey Road Industrial Park, Commercial Way Park Royal London NW10 7XF
Country	UK
Telephone	+44 (0) 208 965 9281
Fax	+44 (0) 208 965 3239
Email	info@brownell.co.uk
Contact	Robert Beasley
Website	www.brownell.co.uk

1.4 Emergency telephone number

+44 (0) 20 8838 8408 – (08:00 – 17:00) office hours

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

The mixture has been assessed and/or tested for its physical, health and environmental hazards and the following classification applies.

Classification according to Regulation (EC) No. 1272/2008 as amended
This substance does not meet the criteria for classification according to the Regulation (EC) 1272/2008 as amended.

Physical hazard	Not classified as a physical hazard.
Human health hazard	Not classified as a health hazard.
Environmental hazard	Not classified as an environmental hazard.

Addition information Repeated exposure may cause skin dryness or cracking.
Exposure to powder or dusts may be irritating to eyes, nose and throat.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008 [CLP/GHS]

Product identifier Not applicable
Hazard statements Not applicable
Precautionary statements Not applicable
Supplemental hazard information Not applicable
Special rules for supplemental label elements for certain mixtures Not applicable
Additional labeling Not applicable

2.3 Other hazards Not applicable

SECTION 3: Compostition/information on ingredients

3.1 Substances

Substance name	Silica Gel (Silicon Dioxide) >98%	Methyl Violet <0.2%	Water <2%
Index No	-	-	-
EC No	231-545-4	208-953-6	231-791-2
REACH No	JT211170-39	-	-
CAS No	(12926-00-8) 7631-86-9	548-62-9	7732-18-5

Purity Not Applicable
Synonyms Silica, amorphous; silica, precipitated and gel.
Stabilisers Not Applicable
Hazard Impurities Not Applicable

3.2 Mixtures Not applicable
Additional information This mixture does not contain further substances fulfilling the criteria of hazard class “acute toxicity” according to CLP regulation.

SECTION 4: First Aid measures

General information If exposed or concerned, get medical advice/attention. Show this safety data sheet to the doctor in attendance.

4.1 Description of first aid measures

Inhalation If dust from the material is inhaled, remove the affected person immediately from the source of exposure to fresh air, seek medical attention if symptoms develop or persist.

Skin contact	Wash spillage from skin with soap and water, seek medication attention if irritation develops and persists.
Eye Contact	Do not rub eyes. Rinse with water, seek medical attention if irritation develops and persists.
Ingestion	Rinse out mouth with water thoroughly; seek medical attention if symptoms occur. If ingestion of a large amount does occur, seek medical attention.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms	Dust may irritate the respiratory tract, skin and eyes.

4.3 Indication of any immediate medical attention and special treatment needed

Notes for the doctor	Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media	Any media suitable for the surrounding fire.
Unsuitable extinguishing media	Not applicable and unused material will not burn.

5.2 Special hazards arising from the substance or mixture

Hazardous combustion products	Inorganic compound, not combustible and is not considered to be a fire hazard.

5.3 Advice for firefighters

Additional information	Special protective equipment for fire-fighters - Full protective clothing must be worn in case of fire and appropriate breathing equipment for surrounding fire.

SECTION 6: Accidental release measure

6.1 Personal precautions, protective equipment and emergency procedures.

For non-emergency personnel

Protective equipment	Avoid inhalation of dust from the spilled material. Wear a dust mask if dust is generated above exposure limits. Wear appropriate protective equipment and clothing during clean-up. Ensure adequate ventilation.
Emergency procedures	Keep unnecessary personnel away.

6.2 Environmental precautions No special precautions.

6.3 Methods and materials for containment and cleaning up

For containment	Contain spillage, collect material using a vacuum cleaner equipped with HEPA filter and collect in suitable container for disposal.
For cleaning up	Large Spills: Wet down with water and pile for later disposal. Shovel the material into waste container. Following product recovery, flush area with water. Small Spills: Sweep up or vacuum up spillage to avoid the generation of dust during clean-up and collect in suitable container for disposal.

6.4 Reference of other sections

Additional information	For personal protection, see section 8 of the SDS. For waste disposal, see section 13.

SECTION 7: Handling and Storage

7.1 Precautions for safe handling

Protective measures	
Advice on safe handling	Wear appropriate personal protective equipment. Do not breathe dust from this material, avoid creating any dust and contact with skin and eyes as this may cause irritation.
Fire preventions	During handling electrostatic charges can accumulate, therefore static electricity and formation of sparks must be prevented, use proper bonding and/or grounding procedures.
Aerosol and dust generation preventions	Keep formation of airborne dusts to a minimum. Provide appropriate exhaust ventilation at places where dust is formed.
Environment precautions	No special environmental precautions required.
Advice on general occupational hygiene	Observe good industrial hygiene practices.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures and storage conditions	Suitable for any general chemical storage area. Provide appropriate exhaust ventilation at places where dust is formed.
Packaging materials	Keep all material in an air-tight container, material is hygroscopic.
Requirements for storage rooms and vessels	All containers must be kept in a dry, cool place. Store in a well-ventilated place.
Hints on storage assembly:	
Storage class	Not Available
Materials to avoid	Not Applicable

7.3 Specific end uses

Recommendations	Not applicable
Specific end uses	The specified uses for this material are shown in section 1 of the document.

SECTION 8: Exposure controls/personal protection

8.1 Control Parameters

8.1.1 Occupational exposure limits**:**
UK. EH40 Workplace Exposure Limits (WELs)

Substance Name	EC-No.	CAS-No.	Type	Value	Occupational exposure limit value	
					Long Term	Short Term
Silica, Amorphous – Inhalable dust	231-545-4	(12926-00-8) 7631-86-9	TWA	OES 6mg/m^3	8 Hours	-
Silica, Amorphous – Respirable dust	231-545-4	(12926-00-8) 7631-86-9	TWA	OES 2.4mg/m^3	8 Hours	-
Silica gel	231-545-4	(12926-00-8) 7631-86-9	TWA	ACGIH: TLV 10mg/m^3	8 Hours	-
Methyl Violet	208-953-6	548-62-9	TWA	ACGIH: 0.5mg/m^3	8 Hours	-

8.1.2 Biological limits values No biological exposure limits noted for the ingredient(s).

8.1.3 Exposure limits at intended use Not applicable

8.1.4 DNEL/PNEC-values DNEL / PNEC < 1 = No immediate concern

8.1.5 Risk management measures according to used control banding approach Not applicable

8.2 Exposure controls

8.2.1 Appropriate engineering controls: Engineering methods to prevent or control exposure are preferred. Methods include process or personnel enclosure, mechanical ventilation (dilution and local exhaust) and control of process conditions.

8.2.2 Personal protective equipment

Eye / Face protection:
Suitable eye protection Wear suitable eye protection (safety glasses with side shields).

Skin protection:
Hand protection Suitable gloves can be recommended by the glove supplier.
Body protection Wear lab coat over normal work clothing (long sleeved shirts and long pants) is recommended.

	Respiratory protection	Avoid inhalation of dust. Wear suitable respiratory protection equipment if working in confined spaces with inadequate ventilation or whenever there is any risk of the exposure limits being exceeded.
	Thermal hazards	None known
8.2.3	**Environmental exposure controls**	None known

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance:
Physical state: Solid beads **Colour:** Dry: Yellow/Orange Saturated: Green **Odour:** Odourless

pH	2-10 (5% Aqueous Solution)
Melting Point	>1000°C
Boiling Point	Not Applicable
Flash Point	Not Applicable
Evaporation rate	Not available
Flammability (solid, gas)	Non-flammable
Upper/lower flammability or explosive limits	
Upper explosive limits	Not Applicable
Lower explosive limits	Not Applicable
Vapour pressure	Not available
Vapour density	Not available
Relative density	2.1 (water = 1)
Solubility(ies)	Less 1.0% in weight
Partition coefficient: n-octanol/water	Not available
Auto-ignition temperature	Not available
Decomposition temperature	Not available
Viscosity	Not available
Viscosity, dynamic	Not available
Viscosity, cinematic	Not available
Explosive properties	Not available
Oxidising properties	Not available

9.2 Other information:

Physical hazards	
Explosives:	Not available
Flammable gases:	Not applicable
Flammable aerosols:	Not applicable
Oxidising gases:	Not available
Gases under pressure:	Not available

Flammable liquids:	Not applicable
Flammable solids:	Not applicable
Self-reactive substances and mixtures	Not available
Pyrophoric liquids	Not available
Pyrophoric solids	Not available
Self-heating substances and mixtures	Not available
Substances or mixtures which, in contact with water emit flammable gases	Not available
Oxidising liquids	Not available
Oxidising solids	Not available
Organic peroxides	Not available
Metal corrosion	Not available

SECTION 10: Stability and reactivity

10.1 Reactivity The product is stable and non-reactive under normal conditions of use, storage and transport

10.2 Chemical stability Material is stable under normal conditions and hygroscopic

10.3 Possibility of hazardous reactions No dangerous reaction known under conditions of normal use

10.4 Conditions to avoid Not available

10.5 Incompatible materials Not available

10.6 Hazardous decomposition products No hazardous decomposition products are known

SECTION 11: Toxicological information

11.1 Information on toxicological effects
11.1.1 Substances
Acute toxicity: Animal data

Substance	Effect dose / concentration	Value	Species
Acute oral toxicity	LD50	>15,000mg/kg	Rat
Acute dermal toxicity	LD50	>5,000mg/kg	Rabbit
Acute inhalation	LC50	>0.139mg/1/14h	Rat

Skin corrosion/irritation	No data available
Eye damage/irritation	No data available

Sensitisation to the respiratory tract/skin	No data available
Germ cell mutagenicity	No data available
Carcinogenicity	Amorphous silica is not classifiable as to its carcinogenicity to humans (Group 3).
Reproductive toxicity	No data available
Specific target organ toxicity (single exposure)	No data available
Specific target organ toxicity (repeated exposure)	No data available
Aspiration hazard	Dust may irritate lungs. Amorphous silica is not known to cause silicosis.
Physical, chemical and toxicological characteristics	
In case of ingestion	No data available
In case of skin contact	Dust may have a drying effect on the skin.
In case of inhalation	Synthetic amorphous silica gel has little adverse effect on lungs and does not produce significant disease or toxic effect when exposure is kept below the permitted limits. However existing medical conditions (eg asthma, bronchitis) may be aggravated by exposure to dust. Effects of dust may be greater and occur at lower levels of exposure in smokers compared to non-smokers.
In case of eye contact	Dust may cause discomfort and mild irritation.

11.1.2 Mixtures No data available

SECTION 12: Ecological information

12.1 Toxicity Synthetic amorphous silica is virtually inert and has no known adverse effect on the environment and not toxic to aquatic life

12.2 Persistence and degradability The product solely consists of inorganic compounds which are not biodegradable. The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential Does not bioaccumulate.

12.4 Mobility in soil Insoluble and thus presents a low mobility in most soils.

12.5 Results of PBT and vPvB assessment This substance is not classified as PBT or vPvB according to current EU criteria.

12.6 Other adverse effects No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product / packaging disposal Product can be reactivated in an oven for re-use.

Waste codes / waste designations according to EWC/AVV	The Waste code should be assigned in discussion between the user, the producer and the waste disposal company. This material is not classified as hazardous waste under EEC Directive 91/689/EEC.
Packaging	No data available
Waste treatment options	Disposal of in accordance with all applicable local and national regulations. This material is not classified as special waste under UK Special Waste Regulations 1996 and can be disposed of by landfill at an approved site.
Other disposal recommendations	Dispose in accordance with all applicable regulations.

SECTION 14: Transport information

14.1 UN No.	Not classified as dangerous goods under the United Nations Transport Recommendations.
14.2 UN Proper Shipping name	Not applicable.
14.3 Transport hazard class(es) Hazard label(s)	Not applicable.
14.4 Packing group	Not applicable.
14.5 Environmental hazards	Not applicable.
14.6 Special precautions for user	Not applicable.
14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.
Land transport (ADR/RID)	Not regarded as dangerous goods
Inland Waterway transport (ADN)	Not regarded as dangerous goods
Sea transport (IMDG)	Not regarded as dangerous goods
Air transport (ICAO-TI / IATA-DGR)	Not regarded as dangerous goods

SECTION 15: Regulatory information

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

15.1.1 EU regulations

Authorisations:	Not applicable
Restrictions on use:	Not applicable

Other EU Regulations:
Directive 2010/75/EC on industrial emissions
Not listed

Directive 2004/42/CE on the limitation of emissions of volatile organic compounds
Not listed

Regulation (EC) No. 842/2006 on certain fluorinated greenhouse gases
Not listed

Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex I
Not Listed

Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex II
Not Listed

Regulation (EC) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 1 as amended
Not Listed

Regulation (EC) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 2 as amended
Not Listed

Regulation (EC) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 3 as amended
Not Listed

Regulation (EC) No. 649/2012 concerning the export and import of dangerous chemicals, Annex V as amended
Not Listed

15.1.2 National regulations Not Available

15.2 Chemical safety assessment No Chemical Safety Assessment has been carried out.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes

Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

SECTION 16: Other information

16.1 Indication of changes

MSDS first issued	18th April 2000
MSDS revision	20th November 2002
MSDS Revised	10th December 2008
MSDS Revised	11th October 2011
MSDS Revised	12th May 2014

16.2 Abbreviations and acronyms

Not applicable

16.3 Key literature references and sources for data

ECHA European Chemicals agency

16.4 Classification for mixtures and used evaluation method according to regulation (EC) 1272/2008 [CLP]

Regulation (EU) No. 1272/2008.
Classification, labelling and packaging of substances and mixtures.
The product does not need to be labelled in accordance with Directive 67/548/EEC.
Not classified as a hazardous substance or mixture according to Directive 1999/45/EC.

16.5 Relevant R-, H- and EUH-phrases (number and full text)

Not applicable

16.6 Training advice

Follow training instructions when handling this material.

16.7 Further information

Not available.

Disclaimer

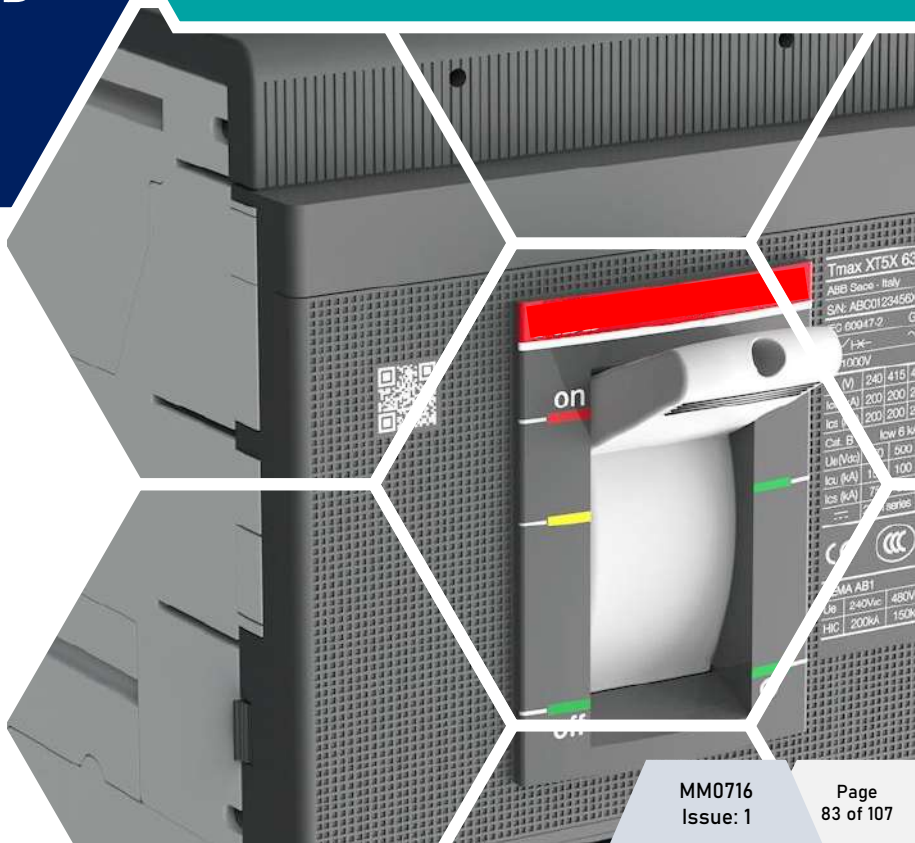
The information provided in the SDS is correct to the best of our knowledge at the date of publication. This document is intended as a guide for safe handling, storage and use in known industrial applications. The manufacturer makes no representation, warranty or guarantee as to its accuracy, reliability or completeness nor assumes any liability for its use. It is the users responsibility to confirm in advance that the information is current, applicable and suitable to their circumstances for each particular use. No representative of ours has authority to waive this provision.

SECTION
10

APPENDIX D

L.V. MCCB SWITCH:
ABB T4N

(PRODUCT CATALOGUE - 21 PAGES)



Technical catalogue / May 2016

SACE Tmax. T Generation
Low voltage moulded-case circuit-breakers from 250 A up to 1600 A

Power and productivity
for a better world™

Index

Main characteristics 1

The ranges 2

Accessories 3

Characteristic curves and technical information 4

Wiring diagrams 5

Overall dimensions 6

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Main characteristics

Overview of the Tmax family 1/2

General 1/4

Construction characteristics

Modularity of the series 1/6

Distinguishing features of the series 1/8

Overview of the Tmax family

Circuit-breakers for AC-DC distribution

Size	[A]						
In	[A]						
Poles	[Nr]						
Ue	[V]	(AC) 50 - 60 Hz					
	[V]	(DC)					
Icu (380-415 V AC)	[kA]	N					
	[kA]	S					
	[kA]	H					
	[kA]	L					
	[kA]	V					
	[kA]	X					

(1) T4 250A L, V version; (2) T6V: 630A and 800A only; (3) T7X: 800A only

Circuit-breakers for zone selectivity

Size	[A]						
Poles	[Nr]						
Ue	[V]	(AC) 50 - 60 Hz					
EFDP zone selectivity							
ZS zone selectivity							

Circuit-breakers for motor protection

Size	[A]						
Poles	[Nr]						
Ue	[V]	(AC) 50 - 60 Hz					
Magnetic only trip unit, IEC 60947-2							
PR221DS-I trip unit, IEC 60947-2							
Ekip M-LRIU trip unit, IEC 60947-4-1							
PR231/P-I trip unit, IEC 60947-2							

Circuit-breakers for use up to 1150 V AC and 1000 V DC

Size	[A]						
Poles	[Nr]						
Icu max	[KA]	1000 V AC					
	[KA]	1150 V AC					
	[KA]	1000 V DC 4 poles in series					

Switch-disconnectors

Ith	[A]						
Ie	[A]						
Poles	[Nr]						
Ue	[V]	(AC) 50 - 60 Hz					
	[V]	(DC)					
Icm	[kA]						
Icw	[kA]						

Note: ABB SACE's moulded-case circuit-breakers are also available in the versions according to UL Standards (see catalogue "ABB SACE molded case circuit-breakers - UL 489 and CSA C22.2 Standard").

	T4	T5	T6	T7
	250[1]/320	400/630	630/800/1000	800/1000/1250/1600
	20…320	320…630	630...1000	200...1600
	3/4	3/4	3/4	3/4
	690	690	690	690
	750	750	750	
	36	36	36	
	50	50	50	50
	70	70	70	70
	120	120	100	120
	200	200	150 [2]	150
				170 [3]

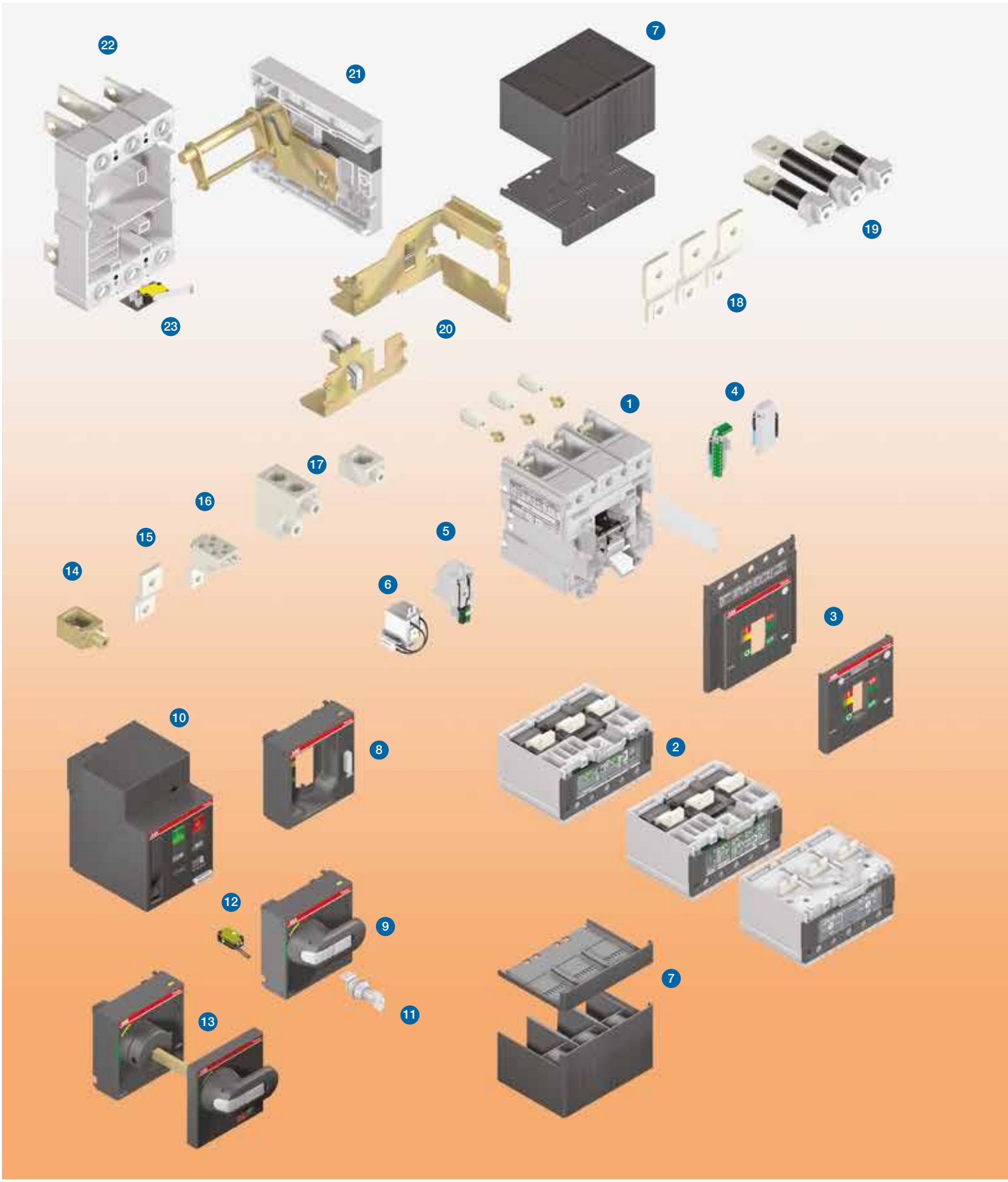
	T4	T5	T6	T7
	250/320	400/630	630/800/1000	800/1000/1250/1600
	3/4	3/4	3/4	3/4
	690/1000	690/1000	690	690
	■	■	■	
				■

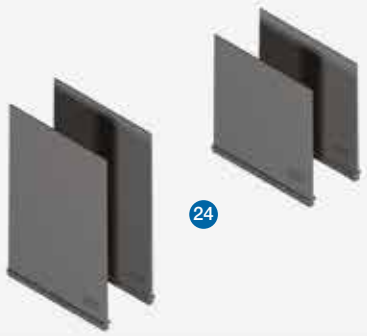
	T4	T5	T6	T7
	250/320	400/630	800	800/1000/1250
	3	3	3	3
	690	690	690	690
	■			
	■	■	■	
	■	■	■	
				■

	T4	T5	T6	
	250	400/630	630/800	
	3/4	3/4	3/4	
	20	20	12	
	12	12		
	40	40	40	

	T4D	T5D	T6D	T7D
	250/320	400/630	630/800/1000	1000/1250/1600
	250/320	400/630	630/800/1000	1000/1250/1600
	3/4	3/4	3/4	3/4
	690	690	690	690
	750	750	750	750
	5.3	11	30	52.2
	3.6	6	15	20

Construction characteristics
Modularity of the series





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Starting from the fixed version circuit-breaker, all the other versions are obtained by means of mounting conversion kits. The following are available:

– kit for converting a fixed circuit-breaker into the moving part of a plug-in and withdrawable one
– circuit-breaker fixed parts for plug-in and withdrawable circuit-breakers
– conversion kit for the connection terminals.

Various accessories are also available:

1. Breaking unit
2. Trip units
3. Front
4. Auxiliary contacts - AUX and AUX-E
5. Undervoltage release - UVR
6. Shunt opening release - SOR and P-SOR
7. Terminal covers
8. Front for lever operating mechanism - FLD
9. Direct rotary handle - RHD
10. Stored energy motor operator - MOE
11. Key lock - KLF
12. Early auxiliary contact - AUE
13. Transmitted rotary handle - RHE
14. Front terminal for copper cable - FC Cu
15. Front extended terminal - EF
16. Multi-cable terminal (only for T4) - MC
17. Front terminal for copper-aluminium - FC CuAl
18. Front extended spread terminal - ES
19. Rear orientated terminal - R
20. Conversion kit for plug-in/withdrawable versions
21. Guide of fixed part in the withdrawable version
22. Fixed part - FP
23. Auxiliary position contact - AUP
24. Phase separators
26. Racking out crank handle
27. Residual current release.

Operating temperature

The Tmax circuit-breakers can be used in environmental conditions where the ambient air temperature varies between -25 °C and +70 °C, and stored in ambients with temperatures between -40 °C and +70 °C.
The circuit-breakers fitted with thermomagnetic trip units have their thermal element set for a reference temperature of +40 °C. For temperatures other than +40 °C, with the same setting, there is a thermal trip threshold variation as shown in the table on page 4/50 and following.
The electronic trip units do not undergo any variations in performance as the temperature varies but, in the case of temperatures exceeding +40 °C, the maximum setting for protection against overloads L must be reduced, as indicated in the derating graph on page 4/37 and following, to take into account the heating phenomena which occur in the copper parts of the circuit-breaker passed through by the phase current.
For temperatures above +70 °C the circuit-breaker performances are not guaranteed.
To ensure service continuity of the installations, the way to keep the temperature within acceptable levels for operation of the various devices and not only of the circuit-breakers must be carefully assessed, such as using forced ventilation in the switchboards and in their installation room.

Altitude

Up to an altitude of 2000 m Tmax circuit-breakers do not undergo any alterations in their rated performances. As the altitude increases, the atmospheric properties are altered in terms of composition, dielectric resistance, cooling capacity and pressure. Therefore the circuit-breaker performances undergo derating, which can basically be measured by means of the variation in significant parameters such as the maximum rated operating voltage and the rated uninterrupted current.

Altitude	[m]	2000	2600	3000	3900	4000	5000
Derating on service voltage, Ue	[%]	100	93	88	79	78	68
Derating on uninterrupted current	[%]	100	99	98	94	93	90

Electromagnetic compatibility

Operation of the protections is guaranteed in the presence of interferences caused by electronic apparatus, atmospheric disturbances or electrical discharges by using the electronic trip units and the electronic residual current releases. No interference with other electronic apparatus near the place of installation is generated either. This is in compliance with the IEC 60947-2 Appendix B + Appendix F Standards and European Directive No. 89/336 regarding EMC - electromagnetic compatibility.

Tropicalisation

Circuit-breakers and accessories in the Tmax series are tested in compliance with the IEC 60068-2-30 Standard, carrying out 2 cycles at 55 °C with the “variant 1” method (clause 7.3.3). The suitability of the Tmax series for use under the most severe environmental conditions is therefore ensured with the hot-humid climate defined in the climatograph 8 of the IEC 60721-2-1 Standards thanks to:

– moulded insulating cases made of synthetic resins reinforced with glass fibres;
– anti-corrosion treatment of the main metallic parts;
– Fe/Zn 12 zinc-plating (ISO 2081) protected by a conversion layer, free from hexavalent-cromium (ROHS-compliant), with the same corrosion resistance guaranteed by ISO 4520 class 2c;
– application of anti-condensation protection for electronic overcurrent releases and relative accessories.

Resistance to shocks and vibrations

Tmax T circuit-breakers are unaffected by vibrations generated mechanically and due to electromagnetic effects, in compliance with the IEC 60068-2-6 Standards and the regulations of the major shipping registers[1] [2]:

– RINA
– Det Norske Veritas
– Bureau Veritas
– Lloyd’s register of shipping
– Germanischer Lloyd
– ABS
– Russian Maritime Register of Shipping
– Nippon Kaiji Kyokai.

The T4-T7 Tmax circuit-breakers are also tested, according to the IEC 60068-2-27 Standard, to resist shocks up to 12g for 11 ms. Please ask ABB SACE for higher performances in terms of resistance to shocks.

[1] Ask ABB for specific certifications
[2] Except for T6V

The ranges

Tmax circuit-breakers for power distribution

Electrical characteristics	2/2
General characteristics	2/4
Thermomagnetic trip units	2/6
Electronic trip units	2/8

Circuit-breaker for zone selectivity

Electrical characteristics	2/34
General characteristics	2/35
EFDP Zone selectivity: PR223EF	2/36
ZS Zone selectivity: PR332/P	2/39

Tmax circuit-breakers for motor protection

Electrical characteristics	2/40
General characteristics	2/42
Protection against short-circuit	2/43
Integrated protection: Ekip M-LRIU	2/46

Tmax circuit-breakers for use up to 1150 V AC and 1000 V DC

Electrical characteristics	2/51

Switch-disconnectors

Electrical characteristics	2/54

Circuit-breakers for power distribution
Electrical characteristics

				Tmax T4 (12)				
Rated uninterrupted current			[A]	250/320				
Poles			[No.]	3/4				
Rated service voltage, **Ue**	(AC) 50-60 Hz		[V]	690				
	(DC)		[V]	750				
Rated impulse withstand voltage, **Uimp**			[kV]	8				
Rated insulation voltage, **Ui**			[V]	1000				
Test voltage at industrial frequency for 1 min.			[V]	3500				
Rated ultimate short-circuit breaking capacity, **Icu**				**N**	**S**	**H**	**L**	**V**
	(AC) 50-60 Hz 220/230 V		[kA]	70	85	100	200	200
	(AC) 50-60 Hz 380/400/415 V		[kA]	36	50	70	120	200
	(AC) 50-60 Hz 440 V		[kA]	30	40	65	100	180
	(AC) 50-60 Hz 500 V		[kA]	25	30	50	85	150
	(AC) 50-60 Hz 690 V		[kA]	20	25	40	70	80
	(DC) 250 V - 2 poles in series		[kA]	36	50	70	100	150
	(DC) 250 V - 3 poles in series		[kA]	–	–	–	–	–
	(DC) 500 V - 2 poles in series		[kA]	25	36	50	70	100
	(DC) 500 V - 3 poles in series		[kA]	–	–	–	–	–
	(DC) 750 V - 3 poles in series		[kA]	16	25	36	50	70
Rated service short-circuit breaking capacity, **Ics**								
	(AC) 50-60 Hz 220/230 V		[%Icu]	100%	100%	100%	100%	100%
	(AC) 50-60 Hz 380/400/415 V		[%Icu]	100%	100%	100%	100%	100%
	(AC) 50-60 Hz 440 V		[%Icu]	100%	100%	100%	100%	100%
	(AC) 50-60 Hz 500 V		[%Icu]	100%	100%	100%	100%	100%
	(AC) 50-60 Hz 690 V		[%Icu]	100%	100%	100%	100%	100%
Rated short-circuit making capacity, **Icm**								
	(AC) 50-60 Hz 220/230 V		[kA]	154	187	220	440	660
	(AC) 50-60 Hz 380/400/415 V		[kA]	75.6	105	154	264	440
	(AC) 50-60 Hz 440 V		[kA]	63	84	143	220	396
	(AC) 50-60 Hz 500 V		[kA]	52.5	63	105	187	330
	(AC) 50-60 Hz 690 V		[kA]	40	52.5	84	154	176
Opening time (415 V)			[ms]	5	5	5	5	5
Utilisation category (IEC 60947-2)				A				
Reference Standard				IEC 60947-2				
Isolation behaviour				■				
Trip units:	thermomagnetic							
	T fixed, M fixed		TMF	–				
	T adjustable, M fixed		TMD	■ (up to 50 A)				
	T adjustable, M adjustable (5…10 x In)		TMA	■ (up to 250 A)				
	T adjustable, M fixed (3 x In)		TMG	–				
	T adjustable, M adjustable (2.5…5 x In)		TMG	–				
	magnetic only		MA	■				
	electronic		PR221DS	■				
			PR221GP/PR221MP	–				
			PR222DS	■				
			PR223DS	■				
			PR231/P	–				
			PR232/P	–				
			PR331/P	–				
			PR332/P	–				
Interchangeability				■				
Versions				F-P-W				
Terminals	fixed			F-FC Cu-FC CuAl-EF-ES-R-MC				
	plug-in			EF-ES-HR-VR-FC Cu-FC CuAl				
	withdrawable			EF-ES-HR-VR-FC Cu-FC CuAl				
Fixing on DIN rail				–				
Mechanical life			[No. operations]	20000				
			[No. Hourly operations]	240				
Electrical life @ 415 V AC			[No. operations]	8000 (250 A) - 6000 (320 A)				
			[No. Hourly operations]	120				
Basic dimensions - fixed version		3 poles	W [mm]	105				
		4 poles	W [mm]	140				
			D [mm]	103.5				
			H [mm]	205				
Weight	fixed	3/4 poles	[kg]	2.35/3.05				
	plug-in	3/4 poles	[kg]	3.6/4.65				
	withdrawable	3/4 poles	[kg]	3.85/4.9				

TERMINAL CAPTION
F = Front
EF = Front extended
ES = Front extended spread
FC Cu = Front for copper cables
FC CuAl = Front for copper-aluminium cables
R = Rear orientated
HR = Rear flat horizontal
VR = Rear flat vertical
HR/VR = Rear flat orientated
MC = Multicable
F = Fixed circuit-breakers
P = Plug-in circuit-breakers
W = Withdrawable circuit-breakers

TMD/TMA - T4

	In [A]	20	32	50	80	100	125	160	200	250
	Neutral [A] - 100%	20	32	50	80	100	125	160	200	250
I_1 =0.7...1 x In	Neutral [A] - 50%	–	–	–	–	–	80	100	125	160
	I_3 = 10 x In [A]	320	320	500						
	I_3 = 5...10 x In [A]				400…800	500…1000	625…1250	800…1600	1000…2000	1250…2500
I_3 = 10 x In	Neutral [A] - 100%	320	320	500	400…800	500…1000	625…1250	800…1600	1000…2000	1250…2500
I_3 = 5...10 x In	Neutral [A] - 50%	–	–	–	–	–	400…800	500…1000	625…1250	800…1600

TMA - T5

	In [A]	320	400	500
	Neutral [A] - 100%	320	400	500
I_1 = 0.7...1 x In	Neutral [A] - 50%	200	250	320
	I_3 [A]	1600…3200	2000…4000	2500…5000
	Neutral [A] - 100%	1600…3200	2000…4000	2500…5000
I_3 = 5...10 x In	Neutral [A] - 50%	1000…2000	1250…2500	1600…3200

TMG - T5

	In [A]	320	400	500
	Neutral [A] - 100%	320	400	500
I_1 = 0.7...1 x In				
	I_3 [A]	800…1600	1000…2000	1250…2500
	Neutral [A] - 100%	800…1600	1000…2000	1250…2500
I_3 = 2.5...5 x In				

TMA - T6

	In [A]	630	800
	Neutral [A] - 100%	630	800
I_1 = 0.7...1 x In	Neutral [A] - 50%	400	500
	I_3 [A]	3150...6300	4000...8000
	Neutral [A] - 100%	3150...6300	4000...8000
I_3 = 5...10 x In	Neutral [A] - 50%	2000...4000	2500...5000

Notes

– In identifies the setting current for protection of the phases (L1, L2 and L3) and of the neutral.

– The TMA and TMG thermomagnetic trip units which equip the Tmax T4, T5 and T6 circuit-breakers have the thermal element with adjustable threshold I_1 = 0.7…1 x In. The set current value which is obtained using the special selector is intended at 40 °C. The magnetic element has adjustable trip threshold (I_3 = 5…10 x In for TMA and I_3 = 2.5…5 x In for TMG) with a tolerance of ± 20% according to what is indicated in the IEC 60947-2 (par. 8.3.3.1.2) Standard. The trip thresholds of the magnetic protection I_3 are a function of the setting used both by the phase and neutral protection.

Basic protection functions

(L) Protection against overload
This protection function trips when there is an overload with inverse long-time delay trip according to the IEC 60947-2 Standard (I^2t=k). The protection cannot be excluded.

(S) Protection against short-circuit with time delay
This protection function trips when there is a short-circuit, with long inverse time-delay trip (I^2t=k ON) or a constant trip time (I^2t=k OFF). The protection can be excluded.

(I) Instantaneous protection against short-circuit
This protection function trips instantaneously in case of a short-circuit. The protection can be excluded.

(G) Protection against earth fault
The protection against earth fault trips when the vectorial sum of the currents passing through the current sensors exceeds the set threshold value, with long inverse time-delay trip (I^2t=k ON) or a constant trip time (I^2t=k OFF). The protection can be excluded.

Advanced protection functions

The PR332/P trip unit makes it possible to carry out highly developed protection against the most varied types of fault.

In fact, it adds the following advanced protection functions to the basic protection functions.

IEC 60255-3

(L) Protection against overload (IEC 60255-3)
This protection trips in case of an overload with inverse long-time delay according to IEC 60255-3 Standard, for the coordination with fuses and MV protections. The protection can be excluded.

(U) Protection against unbalanced phase
The protection function against unbalanced phase U can be used in those cases where a particularly precise control is needed regarding missing and/or unbalance of the phase currents. The trip time is instantaneous. The protection can be excluded.

(OT) Protection against overtemperature
The protection against overtemperature trips instantaneously when the temperature inside the trip unit exceeds 85 °C, in order to prevent any temporary or continual malfunction of the microprocessor. The protection cannot be excluded.

(Rc) Protection against residual current [1]
This integrated protection is based on current measurements made by an external toroid and is alternative to protection against earth fault G. The protection can be excluded.

(ZS) Zone selectivity [2]
ZS zone selectivity is an advanced method for carrying out coordination of the protections in order to reduce the trip times of the protection closest to the fault in relation to the time foreseen by time selectivity. Zone selectivity can be applied to the protection functions S and G, with constant time-delay trip. The protection can be excluded.

(UV, OV, RV) Protections against voltage
The three protections trip with a constant time-delay in the case of undervoltage, overvoltage and residual voltage respectively. The latter allows to detect interruptions of the neutral (or of the earthing conductor in systems with earthed neutral) and faults which cause movement of the star centre in systems with isolated neutral (e.g. large earth faults) to be identified. Movement of the star centre is calculated by vectorially summing the phase voltages. The protections can be excluded.

(RP) Protection against reversal of power
The protection against reversal power causes tripping of the breaker, with constant time-delay trip, when the flow of power reverses sign and exceeds, as an absolute value, the set threshold. It is particularly suitable for protection of large machines such as generators. The protection can be excluded.

(UF, OF) Protections of frequency
The two protections detect the variation in network frequency above or below the adjustable thresholds, opening the circuit-breaker, with constant time-delay trip. The protection can be excluded.

[1] It is not suitable for human protection.
[2] For further information about zone selectivity, please see the section: “Circuit-breakers for zone selectivity”.

Electronic trip units for power distribution

SACE PR221DS

	PR221DS	PR221DS
Protection functions	L S / I	I

SACE PR222DS/P

	PR222DS/P	PR222DS/P
Protection functions	L S I	L S I G

SACE PR222DS/PD

	PR222DS/PD	PR222DS/PD
Protection functions	L S I	L S I G

SACE PR223DS

	PR223DS
Protection functions	L S I G

SACE Ekip E-LSIG

	Ekip E-LSIG
Protection functions	L S I G

SACE PR231/P

	PR231/P	PR231/P
Protection functions	L S / I	I

SACE PR232/P

	PR232/P
Protection functions	L S I

SACE PR331/P

	PR331/P
Protection functions	L S I G

SACE PR332/P

	PR332/P	PR332/P	PR332/P	PR332/P
Protection functions	L I	L S I	L S I G(1)	L S I Rc
Advanced protection function(*)	L(***) U OT	L(***) U OT	L(***) U OT	L(***) U OT
Opt.(**)	UV OV RV RP UF OF	UV OV RV RP UF OF	UV OV RV RP UF OF	UV OV RV RP UF OF

(1) In alternative to Rc (with external toroid).
(*) For all versions.
(**) Available with PR330/V. Measurement module.
(***) According to IEC 60255-3.

Circuit-breakers for power distribution
Electronic trip units

PR221DS

The PR221DS trip unit, available for T4, T5 and T6, provides protection functions against overload L and short-circuit S/I (version PR221DS-LS/I): with this version, by moving the dedicated dip-switch, you can choose whether to have inverse time-delay S or instantaneous I protection against short-circuit. Alternatively, the version with only the protection function against instantaneous short-circuit I is available (version PR221DS-I, also see page 2/40 and following).
There is a single adjustment for the phases and the neutral.

For T4, T5 and T6 it is possible to select the protection threshold OFF, 50% or 100% directly from the front of the trip unit by means of the specific dip switch.
For Tmax T4, T5 and T6, the opening solenoid is housed internally and therefore, by not using the right-hand slot of the circuit-breaker, all the auxiliary contacts available can be used.

PR221DS-LS/I

Protection S
Against short-circuit with delayed trip

Protection L
Against overload

Dip-switch for neutral setting (only for T4, T5 and T6)

Socket for Ekip TT test unit

Protection I
Against short-circuit with instantaneous trip

Protection functions and parameterisations

Protection functions[1]		Trip threshold	Trip curves	Excludability	Relation t=f(I)
L	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve ($I^2t=k$) according to IEC 60947-2 Standard	I_1 = 0.40 - 1 x In step = 0.04 x In Trip between 1.1...1.30 x I_1 (T4,T5,T6)	at 6 x I_1 t_1 = 12s **(only for T4,T5,T6)** Tolerance: ± 10% up to 6 x In (T4,T5,T6) ± 20% above 6 x In (T4,T5,T6)	–	$t = k/I^2$
S	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time ($I^2t=k$) (selectable as an alternative to protection function I)	I_2 = 1-1.5-2-2.5-3-3.5-4.5-5.5-6.5-7-7.5-8-8.5-9-10 x In[2] Tolerance: ± 10% (T4,T5,T6)	at 8 x In t_2 = 0.1 - 0.25s Tolerance: ± 10% up to 6 x In (T4,T5,T6) ± 20% above 6 x In (T4,T5,T6) ± 20% (T2)	■	$t = k/I^2$
I	Against short-circuit with instantaneous trip (selectable as an alternative to protection function S)	I_3 = 1-1.5-2-2.5-3-3.5-4.5-5.5-6.5-7-7.5-8-8.5-9-10 x In[2] Tolerance: ± 10% (T4,T5,T6)	instantaneous	■	t = k

[1] These tolerances hold in the following conditions:
– self-powered trip unit at full power (without start-up)
– two or three-phase power supply
In conditions other than those considered, the following tollerances hold:

	Trip threshold	Trip time
S	± 20%	± 20%
I	± 20%	≤ 40ms

[2] For T4 In = 320 A. T5 In = 630 A and T6 In = 1000 A ⇒ I_2max = 9.5 x In, I_3max = 9.5 x In.
The setting at 10 x In corresponds to 9.5 x In.

PR222DS/P

The PR222DS/P trip unit, available for T4, T5 and T6, has protection functions against overload L, delayed S and instantaneous I short-circuit (version PR222DS/P-LSI). Alternatively, as well as the functions L, S, I, it also has protection against earth fault G (version PR222DS/P-LSIG). Setting of the PR222DS trip unit can be carried out by means of dip switches on the front of the circuit-breaker or electronically, using the Ekip T&P programming and control unit or the Ekip Bluetooth wireless communication unit.
There is a single setting for the phases and neutral, for which one can decide whether to set the threshold of the protection functions to OFF, to 50% or to 100% that of the phases by means of two dedicated dip switches.
Furthermore, on the front of the PR222DS/P (or PR222DS/PD) trip units, signalling of pre-alarm and alarm of protection L is available. The pre-alarm threshold value, signalled by the red LED fixed, is equal to 0.9 x I_1. It is also possible to transmit remotely the alarm of protection L, simply connecting connector X3 to the dedicated contact.

PR222DS/PD

Apart from the protection functions available for the PR222DS/P trip unit (for the settings see page 2/20), the PR222DS/PD trip unit, available for T4, T5 and T6 also has the dialogue unit integrated with Modbus® RTU protocol.
The Modbus® RTU protocol has been known and used worldwide for many years and is now a market standard thanks to its simplicity of installation, configuration and to its integration in the various different supervision, control and automation systems, as well as good level performances.
The PR222DS/PD trip units allow the Tmax T4, T5 and T6 circuit-breakers to be integrated in a communication network based on the Modbus® RTU protocol. Modbus® RTU provides a Master-Slave system architecture where a Master (PLC, PC…) cyclically interrogates several Slaves (field devices). The devices use the EIA RS485 standard as the physical means for data transmission at a maximum transmission speed of 19.2 kbps.

Again for this trip unit, the power supply needed for correct operation of the protection functions is supplied directly by the current transformers of the trip unit, and tripping is always guaranteed, even under conditions of single-phase load down. Nevertheless, communication is only possible with an auxiliary power supply of 24 V DC.

PR222DS/PD - Electrical characteristics

Auxiliary power supply (galvanically insulated)	24 V DC ± 20%
Maximum ripple	± 5%
Inrush current @ 24 V	1 A for 30 ms
Rated current @ 24 V	100 mA
Rated power @ 24 V	2.5 W

The PR222DS/PD release, with integrated communication and control functions, allows a wide range of information to be acquired and transmitted remotely, opening and closing commands to be carried out by means of the electronic version motor operator, the configuration and programming parameters of the unit to be stored, such as the current thresholds of the protection functions and the protection curves.
All the information can be consulted both locally, directly on the front of the circuit-breaker with the front display unit FDU or on the HMI030 switchgear multi-meter, and remotely by means of supervision and control systems.
Moreover, by means of the Ekip Bluetooth external module, to be connected to the test connector of the PR222DS/PD trip unit, wireless communication to a PDA or Notebook is possible through a Bluetooth port.
The PR222DS/PD trip units can be associated with the AUX-E auxiliary contacts in electronic version, to know the state of the circuit-breaker (open/closed), and with MOE-E motor operator (the AUX-E are compulsory when MOE-E is to be used) to remotely control circuit- breaker opening and closing as well.
If the circuit-breaker fitted with the PR222DS/PD trip unit is inserted in a supervision system, during the test phases with the Ekip T&P unit, communication is automatically abandoned and starts again on completion of this operation.

Circuit-breakers for power distribution
Electronic trip units

Communication functions	PR222DS/P	PR222DS/PD	Ekip E-LSIG, PR223DS
Protocol		Modbus RTU standard	Modbus RTU standard
Physical medium		EIA RS485	EIA RS485
Speed (maximum)		19.2 kbps	19.2 kbps
Measurement functions			
Phase currents	■ (1)	■	■
Neutral current	■ (1)	■	■
Ground current	■ (1)	■	■
Voltages (phase to phase, phase to earth)			■ (6)
Powers (active, reactive, apparent)			■ (6)
Power factors			■ (6)
Energies			■ (6)
Peak factor			■
Frequency			■ (6)
Harmonics			■
Signalling functions			
L pre-alarm and alarm LED	■ (5)	■ (5)	■
L alarm output contact (2)	■	■	■
Available data			
Circuit-breaker status (open, closed) (3)		■	■
Mode (local, remote)		■	■
Protection parameters set	■ (1)	■	■
Alarms			
Protections: L, S, I, G	■ (1)	■	■
Failed tripping under fault conditions	■ (1)	■	■
Maintenance			
Total number of operations (3)		■	■
Total number of trips		■	■
Number of trip tests		■	■
Number of manual operations		■	■
Number of trips for each individual protection function		■	■
Record of last trip data		■	■
Commands			
Circuit-breaker opening/closing (with motor operator)		■	■
Alarm reset	■ (1)	■	■
Circuit-breaker reset (with motor operator)		■	■
Setting the curves and protection thresholds	■ (1)	■	■
Safety function			
Automatic opening in the case of failed Trip command fail (with motor operator) (4)		■	■
Events			
Changes in circuit-breaker state, in the protections and all the alarms		■	■

(1) With Ekip T&P or Ekip Bluetooth
(2) Typical contact: MOS photo Vmax: 48 V DC/30 V AC
Rmax = 35 ohm
(3) Available with AUX-E electronic auxiliary contacts
(4) The motor operator must be in electronic version (MOE-E) and electronic auxiliary contacts (AUX-E) have to be used
(5) Signals: – Pre-alarm L - permanently lit
– Alarm L - flashing (0.5 s ON / 0.5 s OFF)
– Incongruent manual setting (L > S / S > I) - flashing (1 s ON / 2 s OFF)
– WINK (remote control to identify the relay) - flashing (0.125 s ON / 0.125 s OFF)
(6) With VM210 on PR223DS

PR222DS/P

Protection S
Against short-circuit with delayed trip

Protection L
Against overload

Socket for Ekip TT test unit

Socket for connection of Ekip T&P test unit and Ekip Bluetooth wireless communication unit

Protection I
Against short-circuit with instantaneous trip

Dip-switch for neutral setting

Selection for electronic or manual setting

PR222DS/PD

Protection S
Against short-circuit with delayed trip

Protection L
Against overload

Socket for Ekip TT test unit

Socket for connection of Ekip T&P test unit and Ekip Bluetooth wireless communication unit

Protection I
Against short-circuit with instantaneous trip

Dip-switch for neutral setting

Enablement of remote operations

Selection for electronic or manual setting

PR223DS

Socket for connection of Ekip T&P test unit and Ekip Bluetooth wireless communication unit

Socket for Ekip TT test unit

LED signalling alarm of the circuit-breaker

LED signalling the status of the circuit-breaker

Push botton for operation mode selection (local/remote) and on-board diagnosis system

Circuit-breakers for power distribution
Electronic trip units

PR222DS/P, PR222DS/PD and PR223DS[5] - Protection functions and parameterisations

Protection functions		Trip threshold	Trip curves[1]	Excludability	Relation t = f(I)
L	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve ($I^2t=k$) according to IEC 60947-2 Standard	**Manual setting** I_1 = 0.40….1 x In step = 0.02 x In	**Manual setting** at 6 x I_1 t_1 = 3 - 6 - 9/12 - MAX[2]	–	$t = k/I^2$
		Electronic setting I_1= 0.40…1 x In step 0.01 x In Trip between 1.1…1.3 x I_1	**Electronic setting** at 6 x I_1 t_1 = 3…18s step 0.5s[2] Tolerance: ± 10%		
S	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time ($I^2t=k$) or definite time	**Manual setting** I_2 = 0.6-1.2-1.8-2.4-3-3.6-4.2-5.8-6.4-7-7.6-8.2-8.8-9.4-10 x In[3]	**Manual setting** at 8 x In t_2 = 0.05 - 0.1- 0.25 - 0.5s	■	$t = k/I^2$
		Electronic setting I_2 = 0.60…10 x In step 0.1 x In Tolerance: ± 10%	**Electronic setting** at 8 x In t_2 = 0.05…0.5s step 0.01s Tolerance: ± 10%[4]		
		Manual setting I_2 = 0.6-1.2-1.8-2.4-3-3.6-4.2-5.8-6.4-7-7.6-8.2-8.8-9.4-10 x In[3]	**Manual setting** t_2 = 0.05 - 0.1 - 0.25 - 0.5s	■	t = k
		Electronic setting I_2 = 0.60…10 x In step 0.1 x In Tolerance: ± 10%	**Electronic setting** t_2 =0.05…0.5s step 0.01s Tolerance: ± 10%[4]		
I	Against short-circuit with instantaneous trip	**Manual setting** I_3 = 1.5-2.5-3-4-4.5-5-5.5-6.5-7-7.5-8-9-9.5-10.5-12 x In[3]	instantaneous	■	t = k
		Electronic setting I_3 = 1.5…12 x In[3] step 0.1 x In Tolerance: ± 10%			
G	Against earth fault with inverse short time delay trip and trip characteristic according to an inverse time curve ($I^2t=k$)	**Manual setting** I_4 = 0.2-0.25-0.45-0.55-0.75-0.8-1 x In	**Manual setting** up to 3.15 x I_4 up to 2.25 x I_4 up to 1.6 x I_4 up to 1.10 x I_4 t_4 = 0.1s t_4 = 0.2s t_4 = 0.4s t_4 = 0.80s	■	$t = k/I^2$ [6]
		Electronic setting I_4 = 0.2…1 x In step 0.1 x In Tolerance: ± 10%	**Electronic setting** t_4 = 0.1…0.8s step 0.01s Tolerance: ± 15%		

[1] These tolerances hold in the following conditions:
– self-powered trip unit at full power and/or auxiliary supply
– two or three-phase power supply
In conditions other than those considered, the following tollerances hold:

	Trip threshold	Trip time
S	± 20%	± 20%
I	± 20%	≤ 50ms
G	± 20%	± 20%

[2] t_1 values for MAX setting:

CB	Electronic setting	Manual setting
T4 320	3…10.5s Step 0.5s	3-6-9-10.5
T5 630		
T6 1000		
T4 250	3…18s Step 0.5s	3-6-9-18
T5 400		
T6 800	3…18s Step 0.5s	3-6-9-18
T6 630	3…18s Step 0.5s	3-6-12-18

[3] For T4 In = 320 A and T5 In = 630 A. T6 In = 1000 A ⇒ I_2max = 9.5 x In and I_3max = 9.5 x In
For T6 In = 800 A ⇒ I_3max = 10.5 x In
[4] Tolerance: ± 10 ms
[5] PR223DS only available on T4 and T6. The setting of the PR223DS trip unit is electronic only (local/remote).
The L protection can be set at I_1 = 0.18...1 x In. For I_1 < 0.4 x In the neutral setting must be at 100% of that of the phases
[6] $t = k/I^2$ up to the current value indicated, t = k (equating to the chosen setting) beyond the current value indicated

Contact us

ABB SACE
A division of ABB S.p.A.
L.V. Breakers
Via Pescaria, 5
24123 Bergamo – Italy
Phone: +39 035 395 111
Fax: +39 035 395 306-433

www.abb.com

1SDC210015D0208 – 2016.05

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Power and productivity
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SECTION 11

APPENDIX E

TEST CERTIFICATES: 103005/1-01

(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 : Siemens **ELECTRICAL SPEC :** 0105517 1

RATING kVA : 50 1 **PHASE** 50 **Hz** **SERIAL No :** 103005/1-01

	PRIMARY	**SECONDARY**
RATED VOLTS :	25000	400
RATED AMPS :	2.00	125

TEMPERATURE CLASS : A **COOLING :** ONAN

REFERENCE TEMPERATURE DEGREES C : 75 **VECTOR GROUP :** 1 Phase

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**	**SECONDARY**
	Ohms	**milli Ohms**
	54.03	8.96

		TEST RESULTS
SHORT CIRCUIT IMPEDANCE :	**%**	3.12
LOAD LOSS :	**Watts**	448
NO LOAD LOSS :	**Watts**	146
NO LOAD CURRENT :	**%**	0.48

INDUCED OVERVOLTS :	200% AT 100Hz	FOR 60 Seconds
SEPARATE SOURCE VOLTS PRIMARY :	70kV AT 50Hz	FOR 60 Seconds
SEPARATE SOURCE VOLTS SECONDARY :	3kV AT 50Hz	FOR 60 Seconds
INSULATION RESISTANCE PRIMARY TO SEC AND EARTH :	98 G Ohms	
INSULATION RESISTANCE SECONDARY TO EARTH :	73 G Ohms	

REMARKS :

TESTED : Mark Jackson **APPROVED :** Peter Jones

WITNESSED : Alan Blackburn, Paul Jones **DATE :** 23/02/2022

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 : Siemens

ELECTRICAL SPEC : 0105517 1

SPECIFICATION : BS EN 60076-1 2011

SERIAL No : 103005/1-01

CUSTOMER PART No : **ISSUE :**

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 : Mark Jackson TEST ENGINEER

DATE : 23/02/2022