

CABLE FLUID PRESSURE GAUGES & SWITCHES

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PURPOSE AND SCOPE

This Specification forms part of a suite of documents which define The National Grid requirements for new plant. The Level 2 Specifications for cable systems, TS 2.5, covers major requirements and there is a series of Level 3 Specifications covering various specific requirements.

This document is a Level 3 Specification giving the requirements for the application of pressure contact gauges and pressure switches for alarms and indications.

BACKGROUND

A positive oil pressure must be maintained at all times to prevent the formation of gaseous voids in the dielectric which would be susceptible to electrical discharge.

A one metre head of oil exerts a pressure of 0.085 bar and therefore the internal working pressure of an oil-filled cable is a function of the route profile. Oil-filled cables are normally designed for a maximum internal pressure of 5.25 bar.

NG's functional requirements for fluid-filled cables are defined in NGTS 3.5.1.

PART 1 – PROCEDURAL

1 GENERAL REQUIREMENTS

1.1 DESIGN LIFE

The installation shall be designed for a life of 40 years. Where this is not practical and part of the installation is likely to require to be replaced or refurbished prior to the end of the 40 year period then this shall be stated at the time of tendering.

1.2 ALARM REQUIREMENTS

Where oil pressure gauges or switches are used the following minimum level of alarm indications shall be provided:

- (i) An individual "Cable Oil Pressure Falling" alarm for each cable and oil section.
- (ii) A group "Cable Oil Pressure Low" alarm for each circuit and oil section.

In some situations better warning and monitoring of oil leak conditions and additional alarms may be specified.

1.3 Pressure Ranges

Equipment used on fluid filled cable systems shall comply with the following working pressure ranges:

- 0 - 2.5 bar
- 0 - 4.0 bar
- 0 - 6.0 bar

Equipment used for other systems shall use a suitable pressure range for the installation.

1.4 Equipment Mounting

All equipment supplied shall be suitable for surface mounting in any position and flanges and fixing hole dimensions shall preferably be to BS EN 837-1 & 2.

1.5 Pressure Connections

The screwed pressure connections on pressure gauges shall be located at the bottom of the case.

The screwed pressure connection shall be non magnetic and shall have a parallel thread size 3/8 inch British Standard Pipe (BSP) to the dimensions given in BS EN 837-1 for Bourdon tube pressure gauges. Use BS EN 837-3 for Diaphragm and Capsule pressure gauges.

1.6 Cable Connections

The cable connections into gauges, pressure switches and pressure transducers shall be the non-disconnectable type. For compatibility with existing installations the connections shall normally consist of 3 m of 300 V flexible cable sealed into the instrument casing, the seal shall prevent ingress of moisture regardless of any cable damage.

External flexible leads shall not be less than 0.75 mm² and any internal flexible leads shall not be less than 0.5 mm².

1.7 Alarm Switches/Contacts

Two sets of individually adjustable contacts shall be provided which have a continuous rating of 1 A at 12 to 60 V d.c. or 0 to 240 V a.c. The contacts shall be suitable for making and breaking loads up to 30 W, 30 VA at voltages up to 240 V a.c.

Contact surfaces shall ensure that the contacts will make after being open and break after being closed for periods of not less than one year.

1.8 Environmental Requirements

1.8.1 Substations

The requirements for electronic equipment in Substation environments are specified in NGTS 3.24.15

Where equipment is mounted within an enclosure it shall be capable of normal operation at a temperature 15°C higher than the upper temperature limit of the environmental class. Insert sub sub-heading text here.

1.8.2 Cable Route

Equipment to be located along the cable route shall comply with one of the following environmental classifications:

Class 1 - Suitable for locations which are not liable to flooding and subject to ambient temperature variations within the limits -10°C and +40°C.

Class 2 - Suitable for locations which are liable to flooding such as in pits or chambers below ground level and subject to ambient temperature variation within the limits of 0°C and +25°C.

Equipment supplied shall be either:

Class A - Suitable for locations subject to vibrations of acceleration of 7.4 m/s² (0.75 times gravitational acceleration).

or

Class B - Suitable for locations subject to vibrations of acceleration of 19.6 m/s² (twice gravitational acceleration).

Class B - Equipment shall be used in the vicinity of railway lines.

1.9 Pressure Gauges

1.9.1 Dials

The scale shall be clearly and indelibly marked using black lettering on a matt white background. The scale, pointers and numerals shall comply with BS 3693-2, and the following requirements shall be incorporated:

- (i) The scales shall be linear.
- (ii) Scales shall have numerals inside the scale marks.

(iii) Minor Marks - Where the number of divisions between major marks is even, the second and subsequent alternative interim marks shall be extended to the same length as the major marks.

(iv) A scale with no boundary lines shall be employed.

1.9.2 Window

The window shall be of uniform thickness and free from all defects. It shall be possible to renew the window assembly in situ without detriment to the sealing of the case assembly.

1.9.3 Gauge Size

The nominal overall diameter of contact type gauges shall be 150 mm.

1.9.4 Liquid Filling

Where necessary, gauges may be filled with liquid. The liquid used shall not be affected by exposure with direct sun light and shall inhibit the formation of fungal or similar growth.

1.9.5 Identification

The maker's name or trademark and serial number shall be indelibly marked on the gauge.

1.9.6 Alarm Contacts

Where gauges are required for operating alarms, each gauge shall have two pairs of contacts which are capable of operating singly.

The contacts shall be mechanically separate and independently adjustable by means of subsidiary pointers which indicate the pressure settings. The adjustment shall be by key without removing the gauge cover or window. Both contacts are to make on falling contact.

Tilting mercury switches are not permitted.

1.10 Pressure Switches

1.10.1 Adjustment

All means of adjustment shall be internal to the case to prevent tampering with the contacts.

1.10.2 Submersible

Switches may be located in pits or chambers below ground and therefore shall be provided with protection to BS EN 60529, classification IP67, except that the depth of water shall be 3 metres.

1.10.3 Contacts

Unless otherwise agreed contacts shall be of the single-pole double-throw (SPDT) type.

2 DATA TRANSMISSION REQUIREMENTS

2.1 General

Alarm transmission between oil monitoring point and substation will be via power cable auxiliary cables.