ICS 01.070;29.240.01

ISBN 0-626-12512-X

NRS 040-2:2000

First edition

Rationalized User Specification

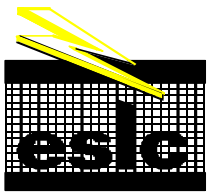
NRS 040-2:2000

HIGH-VOLTAGE OPERATING REGULATIONS

Part 2: Voltage colour coding for diagrammatic displays in control rooms —

Colour coding for wall-mounted operating diagrams and electronic displays relating to the generation, transmission and distribution of electricity

Preferred requirements for applications in the Electricity Supply Industry





This Rationalized User Specification is
issued by the NRS Project
on behalf of the
User Group given in the foreword
and is not a standard as contemplated in the Standards Act, 1993 (Act 29 of 1993).

Rationalized user specifications allow user organizations to define the performance and quality requirements of relevant equipment.

Rationalized user specifications may, after a certain application period, be introduced as national standards.

Amendments issued since publication

Amdt No.	**Date**	**Text affected**

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Printed on behalf of the NRS Project in the Republic of South Africa
by the South African Bureau of Standards
1 Dr Lategan Road, Groenkloof, Pretoria

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Foreword

This part of NRS 040 has been prepared on behalf of the Electricity Suppliers Liaison Committee (ESLC) and approved by it for use by supply authorities.

NRS 040 consists of the following parts, under the general title *High-voltage operating regulations:*

Part 1: Definitions.

Part 2: Voltage colour coding for diagrammatic displays in control rooms — Colour coding for wall-mounted operating diagrams and electronic displays relating to the generation, transmission and distribution of electricity.

Part 3: Model regulations.

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ISBN 0-626-12512-X

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Introduction

This part of NRS 040 was prepared to establish and promote uniform voltage and status colour coding for mimic panels and electronic displays relating to the generation, transmission and distribution of electricity. The intention of this part of NRS 040 is to improve safety by the use of uniform colour coding, and to reduce training requirements.

Key words

Code; Coding; Colour; Diagrams; Mimic; Operating; Screen; Status; Voltage.

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SPECIFICATION

High-voltage operating regulations — Part 2: Voltage colour coding for diagrammatic displays in control rooms —

Colour coding for wall-mounted operating diagrams and electronic displays relating to the generation, transmission and distribution of electricity

Preferred requirements for applications in the Electricity Supply Industry

1 Scope

This part of NRS 040 specifies voltage and status colour coding that are intended for use on mimic panels and electronic displays and that can be used in other appropriate operating diagrams and applications relating to generation, transmission and distribution systems.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of NRS 040. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of NRS 040 are encouraged to investigate the possibility of applying the most recent edition of the standard listed below. Information on currently valid national and international standards can be obtained from the South African Bureau of Standards.

SABS 1091:1975, National colour standards for paint.

Amendment No. 2: May 1989

3 Requirements

3.1 Operating diagrams that are statically displayed on passive mimic boards

3.1.1 Voltage colour coding for passive wall-mounted operating diagrams

The colour code used on passive, wall-mounted operating diagrams to identify a voltage shall be the nominal colour, as specified in accordance with SABS 1091 and given in columns 2 and 3 of table 1 in accordance with the voltage given in column 1 of table 1. This colour coding shall be applied to all items (such as busbars, connecting lines and symbols) on the diagram that are of a particular voltage level.

NOTE The specified colour coding is not applicable to individual phase colours.

Table 1 — Voltage colour codes for passive, wall-mounted operating diagrams and electronic displays

1	2	3	4	5	6
Voltage kV	**Nominal colour**	**SABS 1091 colour**	**Red %**	**Green %**	**Blue %**
0,400	Dark brown	B03 Dark brown	54	27	14
0,525	Dark brown	B03 Dark brown	54	27	14
1,0	Magenta	F18 Jacaranda	100	0	100
2,2	Arctic blue	F28 Arctic blue	11	56	100
3,3	Verdigris green	E22 Verdigris green	0	77	0
6,6	Dark violet	F06 Dark violet	62	12	94
11	Traffic green	E07 Traffic green	0	48	0
22	Black	Black	0	0	0
33	Pink	A58 Protea	100	55	66
44	Light Red	A14 Poppy red	92	36	36
50	Dark red	A09 Flag red	100	0	0
66	Dark red	A09 Flag red	100	0	0
88	Dark blue	F04 National flag blue	0	0	64
110	Dark brown	B03 Dark brown	54	27	14
132	Arctic blue	F28 Arctic blue	11	56	100
165	Arctic blue	F28 Arctic blue	11	56	100
220	Golden brown	B13 Golden brown	71	42	20
275	Orange	B25 Spectrum orange	100	49	0
400	Verdigris green	E22 Verdigris green	0	77	0
532	Dark violet	F06 Dark violet	62	12	94
765	Magenta	F18 Jacaranda	100	0	100

3.1.2 Background colour for passive wall-mounted operating diagrams

The background colour for passive wall-mounted operating diagrams shall be one of those given in table 2.

Table 2 — Background colours for passive wall-mounted operating diagrams

1	2
Colour	**SABS 1091 colour**
Wheat/tan	B64 Biscuit
Pale green	H43 Eau-de-nil

3.2 Operating diagrams that are electronically displayed

Electronically displayed operating diagrams, including large-area (multi-monitor) rear-projection or front-projection electronic wall boards, have the ability to dynamically indicate changes in the system and it is therefore necessary to use a colour coding system that can indicate the full range of voltage levels and system status.

3.2.1 Voltage colour coding for electronic displays

The colour code used on electronic displays to identify a voltage shall be the nominal colour as given in column 2 of table 1, which is obtained by using the percentages of red, green and blue as given in columns 4, 5 and 6 of table 1. This colour coding shall be applied to all items (such as busbars, connecting lines and symbols) on the display that are of a particular voltage level.

NOTE The specified colour coding is not applicable to individual phase colours.

3.2.2 Background colour for electronic displays

The background colour for electronic displays shall be a neutral colour, for example, wheat/light brown, grey or pale green as specified in table 3. As an exception to cater for limitations of technology, a black background may be used.

NOTE If grey is used as a background colour, then it will be necessary to use a contrasting colour for the "disturbed/unknown" status, as an alternative to that specified in tables 4 and 5.

Table 3 — Background colours for electronic displays

1	2	3	4
Colour	**Red**	**Green**	**Blue**
	%	%	%
Wheat/tan	81	69	53
Grey	60	65	80
Pale green	30	100	50

3.2.3 System status

Normally the system shall show all busbars and interconnections in the voltage colour. Interconnections may be black or red throughout. The display shall indicate electrical, operational and feeder zone status as given in 3.2.3.1, 3.2.3.2 and 3.2.3.3.

3.2.3.1 Electrical status

The electrical status of busbars and lines shall be shown by a colour change only, as given in table 4.

NOTE If a system has a topology function, it is able to calculate the electrical state of a busbar or piece of line based on the state of connected breakers and applied earths, etc. Should a switch be in transit, the algorithm will not be able to resolve the state, hence the need for an unknown state.

Table 4 — Graphical query responses for system electrical status

1	2
Operator requests status	**Display shows**
Live	All **live** busbars, components and interconnections are coloured as specified in table 1.
Dead	All **dead** busbars, components and interconnections are coloured **white**, as specified in table 5.
Earthed	All **earthed** busbars, components and interconnections are coloured **yellow**, as specified in table 5, whilst all other parts of the display are dimmed.
Disturbed/unknown	All **disturbed/unknown** busbars, components and interconnections are coloured **grey**, as specified in table 5, whilst all other parts of the display are dimmed.

Table 5 — Electrical status colours for electronic displays

1	2	3	4	5
Status	**Colour**	**Red** %	**Green** %	**Blue** %
Dead	White	100	100	100
Earthed	Yellow	100	100	0
Disturbed/unknown	Grey	60	65	80

3.2.3.2 Operational status

The operational status of busbars and lines shall be shown by a line style change only, as given in table 6.

Table 6 — Graphical query responses for system operational status

1	2
Operator requests status	**Display shows**
Hand over (HO)	All busbars and lines in the style – – – – – – – – –
Permission to operate (PTO)	All busbars and lines in the style – · – · – · – · – ·
Live work hand over (LWHO)	All busbars and lines in the style – ·· – ·· – ·· – ·· – ··

3.2.3.3 Feeder zone status

Feeder zones shall be shown by a highlight colour change only. A highlight is a contrasting strip of colour (obviously it must contrast reasonably against all the live colours and status colours) behind the busbars and interconnecting lines. Each feeder zone is indicated by a different colour of highlight.

NOTE 1 The feeder zone function only applies to newer systems and is used particularly in heavily interconnected systems to show the extent of a particular network. It helps the controller to quickly find the normally open points and also to gauge the extent of supply loss associated with opening a particular breaker.

NOTE 2 A line can be a combination of any of the previously mentioned electrical, operational and feeder zone status indicators. For example, a dead line with HO status would be indicated as a white, dashed line with a highlight colour to show the feeder zone.

Bibliography

The following documents were a source of reference in the compilation of this specification. Although they do not form an integral part of this specification, they are referenced for further information.

SABS 1019:1985, *Standard voltages, currents and insulation levels for electricity supply*.

SCSASAAS1:1996 (Eskom document), *Standard master for regional telecontrol (SMART) human machine interface (HMI).*