

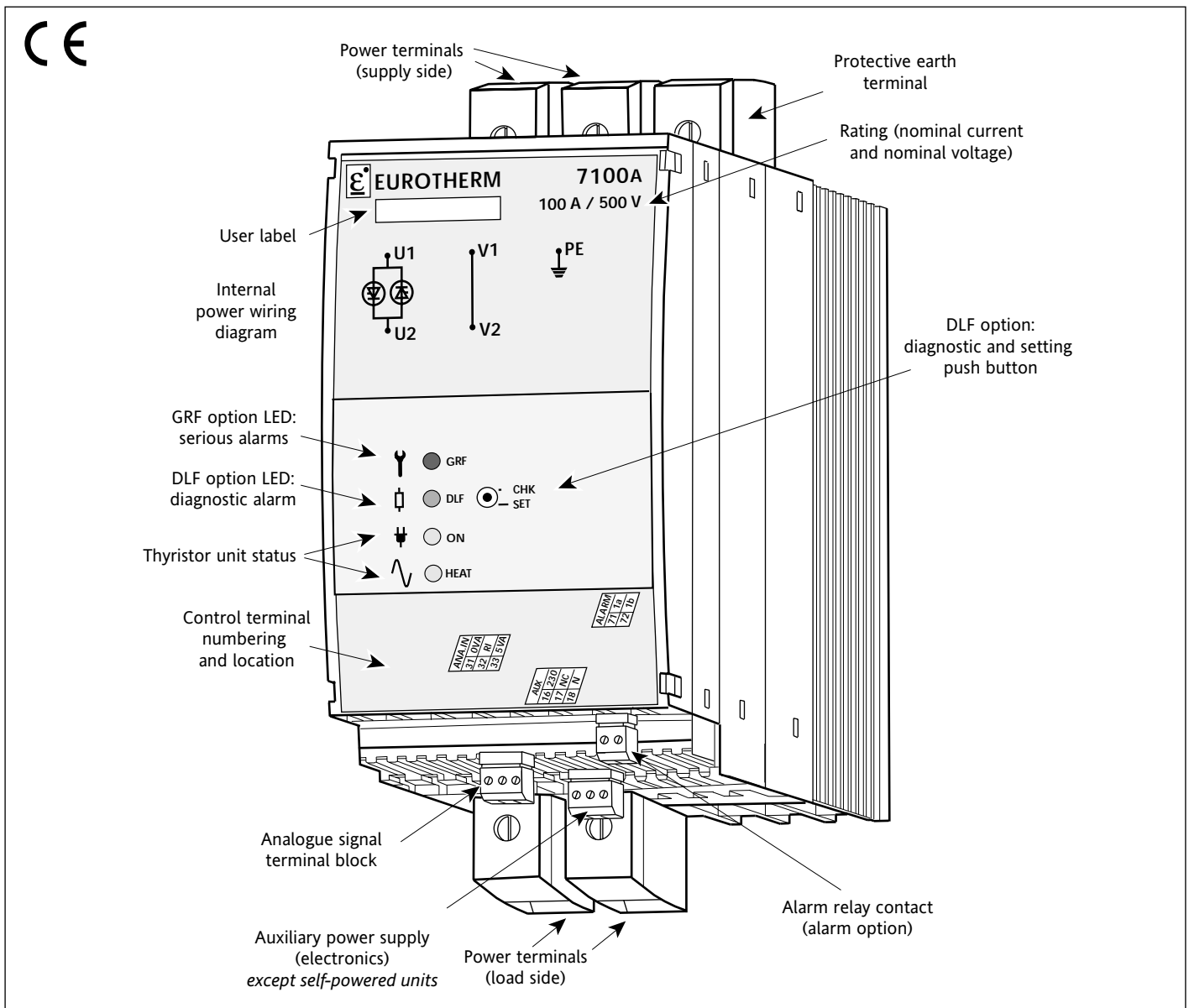
IDENTIFICATION

The 7100A series of power thyristor units can control any type of single phase electric load using 'Phase angle' mode or zero-crossing firing ('Burst mode' or 'Single-cycle mode'). For current ratings up to 100 A, the 7100A units comprise two channels, one controlled by the thyristor (U1 - U2) and one direct internal channel (V1 - V2).

'TYPE 1 ALARMS' OPTIONS

On 'Type 1 alarms' options the 7100A series power thyristor units can detect the following alarms :

- thyristor short circuit
- total load failure
- load fault diagnostic alarm with automatic setting
- over-temperature (for fan-cooled units with current rating ≥ 125 A).



This diagram shows a 'burst mode' or 'single-cycle' version with 'Type 1 alarm' option and with 230 Vac supply for electronics.

TECHNICAL SPECIFICATIONS

Power	
Nominal current	16 A to 630 A at 45 °C (see order code)
Nominal voltage	100 Vac to 690 Vac (see order code).
Frequency	Use from 47 to 63 Hz
Dissipated power	1,3 W (approx.) per amp.
Cooling	Ratings ≤ 100 A: Natural convection Ratings ≥ 125 A: Fan-cooled 115 or 230 Vac fan, consumption 10 VA.
Load	Single-phase industrial load: Resistive load with low or high temperature coefficient, Short wave infrared elements, Transformer primary.
Control	
Supply	Self-powered from supply network or external (115 V or 230 V +10%; -15%) depending on order code. Consumption: 10 VA.
Control type	Analogue (optional digital communication) • Remote analogue setpoint: 0-5 V or 0-10 V (100 kΩ ≈ input), 0-20 mA or 4-20 mA (250 Ω input) • Potentiometer for manual setpoint (5 Vdc supply available).
Firing mode	
<i>Firing at zero crossings</i>	<ul style="list-style-type: none"> • 'Burst mode' base time: 16 or 64 cycles • 'Single-cycle' : base time 1 cycle • Advanced single-cycle' : base firing time 1 cycle; non conduction by half-cycles.
<i>Firing angle variation</i>	• 'Phase angle'
Control	
Control parameter	<ul style="list-style-type: none"> • Standard: Load voltage squared (V^2) • Option: - Apparent power ($V \times I$) - Load current squared (I^2) - Open loop.
Linearity and Stability	Better than ±2% of full scale.
Current limit	Option, depending on firing mode: • Phase angle: Automatic control transfer - from V^2 to I^2 or - from $V \times I$ to I^2 with current recalibration set by potentiometer on front panel. • 'Burst mode' 16 cycle base: Current limited by threshold set using potentiometer on front panel. A control signal is available in $V \times I$ and I^2 to adjust the limit and perform maintenance.
Transient current limit	Option for transformer primary control in burst mode firing: • Safety firing angle ramp on first firing. • First firing delay adjustable using potentiometer on front panel.
Emitted interference reduction	Internal EMC filter for 'burst mode' : ratings ≤ 40 A: standard ratings 63 A to 100 A: optional.

Type 1 alarms (Options)	
Serious alarms (<i>GRF option</i>)	Total load failure and thyristor short circuit detection. Signalled by red 'GRF' LED and alarm relay contact.
Diagnostic alarm (<i>DLF option</i>)	Partial load failure detection. Signalled by orange 'DLF' LED and alarm relay contact. The DLF option includes serious alarm monitoring. Settings: Monitoring diagnosis, alarm adjustment and resetting using push button on front panel Sensitivity: Detects the failure of at least one heating element for six identical elements connected in parallel.
Over-temperature alarm	For all fan-cooled units (≥125 A) operation stops if the temperature threshold is exceeded Signalled by red 'T°' LED and alarm relay (if GRF or DLF option selected).
Type 2 alarms (Option)	
Over-current alarm (<i>ICO Chop Off option</i>)	Operation stopped if current threshold exceeded. Only available with <i>zero crossing</i> firing and <i>DLF</i> option (except for <i>short wave infrared</i> elements, <i>transformers</i> and codes <i>VI</i> CL and <i>V2</i> CL). Alarm threshold adjustable from 20 to 100% using potentiometer on front panel. Signalled by red 'ICO' LED and alarm relay contact.
Alarm relay	Available with alarm options. The relay contact (0.25 A/230 Vac; 32 Vdc) is either open on alarm or closed on alarm depending on the product code.
Communication	Available later.
Environment	
Use	0°C to 45°C at max. altitude of 2000 m.
Storage	-10°C to 70°C.
Pollution	Degree 2 acceptable (defined by IEC 664).
Humidity	RH 5% to 95%, non-condensing, non-streaming.
Protection	IP20 without adding additional protection. Overvoltage category 3 (defined by IEC 664).
Thyristor protection	Varistor and RC snubber. High speed fuse: • rating ≤ 100 A: external • rating ≥ 125 A: internal. No fuse for short wave infrared elements in firing at zero crossings or in phase angle firing mode without current limit.
Signalling	Electronics supply present: green 'ON' LED. Thyristor firing request: green 'HEAT' LED.
CE labelling	Complies with the essential requirements of the European Low Voltage Directive 73/23 EEC (93/68 EEC).
EMC	Complies with EMC standard tests, enabling systems which incorporate 7100A products to be declared compliant with the EMC directive 89/336/EEC with respect to the 7100A products.

Dimensions

CODES (see coding) :

A Options : **V2, OL, XFMR**

B Options : **DLF, GRF, I2, V2I2, V2CL**

C Options : **ICO, VI**CL, **VII**2,

DLF/GRF + I2,

DLF/GRF + V2I2,

DLF/GRF + V2CL

Rating (A)	Height (mm)	Width (mm)			Depth (mm)			Max. weight (kg)
		Basic or A Options	B Options or A + B	C Options or A + C	Basic or A Options	B Options or A + B	C Options or A + C	
16 to 40	156	52.5	52.5	70	193	218	238	0.8
63	156	70	70	70	213	238	238	1.9
80 and 100	226	96	96	96	215	243	243	2.2

Coding:

Ratings	Basic selection	Options
7100A 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / 11 / 12 / 13 / 14 / 15 / 16 / 17 / 18 / 19		

Ratings

1. Nominal current	Code	2. Nominal voltage	Code	3. Power supply for electronics	Code
16 amps	16A	100 volts	100V	Self-powered (100 V to 500 V only)	SELF
25 amps	25A	115 volts	115V	External 115 V supply	115V
40 amps	40A	120 volts	120V	External 230 V supply	230V
63 amps	63A	127 volts	127V		
80 amps	80A	200 volts	200V		
100 amps	100A	230 volts	230V		
125 amps	125A*	277 volts	277V		
160 amps	160A*	400 volts	400V		
200 amps	200A*	460 volts	460V		
250 amps	250A*	480 volts	480V		
315 amps	315A*	500 volts	500V		
400 amps	400A*	690 volts	690V*		
500 amps	500A*				
630 amps	630A*				

4. Fan power supply	Code
≤ 100A: No fan	XXXX
≥ 125A: - 115 V fan and 115 V or SELF electronics	115V
- 230 V fan and 230 V or SELF electronics	230V

Basic selection

5. Thyristor fuse	Code	7. Internal EMC filter	Code	9. Manual language	Code
Fuse without fuse blown microswitch	FUSE	'Phase angle' or ratings ≥ 125 A: no filter	XXXX	French	FRA
Fuse with fuse blown microswitch	MSFU	'Burst mode' or 'Single-cycle' 16 A to 40 A: filter as standard 63 A to 100 A: with filter no filter	FILT FILT NONE	English	ENG
No fuse (<i>short wave infrared elements</i>)	NONE			German *	GER

6. Firing mode	Code	8. Input	Code
'Phase angle'	PA	Analogue signal:	
'Burst mode': base time 16 cycles	C16	current from 0 mA to 20 mA	0mA20
base time 64 cycles	C64	current from 4 mA to 20 mA	4mA20
'Single-cycle': 1 base cycle	FC1	voltage from 0 V to 5 V	0V5
'Advanced single-cycle': 1 base cycle non-firing by half cycles	ASC	voltage from 0 V to 10 V	0V10

10. Selected options	Code
Base version: No options, Standard V ² control <i>End of code</i>	NONE
Version with options: Selection of options	YES

Options for Phase Angle firing

11. Control options	Code
Voltage control (V ²)	V2
Current control (I ²) *	I2
Current limit by control transfer (V ² to I ²) *	V2I2
Current limit by control transfer (V×I to I ²) *	VII2
Open loop *	OL

12. Delay on first firing	Code
No delay on first firing	XXXX

13. Type 1 alarms	Code
Serious Alarms: thyristor short-circuit, total load failure, over-temperature for ratings ≥ 125 A	GRF
Partial load failure and Serious Alarms	DLF
No alarms	NONE

14. Load type	Code
With <i>DLF</i> option: Short wave infrared elements Low temperature coefficient load	SWIR LTCL
Without <i>DLF</i> option or High temperature coefficient load	XXXX

15. Type 2 alarms	Code
No over-current alarm	XXXX

16. Alarm relay contact	Code
With <i>alarm</i> option: Contact closed on alarm	NC
Contact open on alarm	NO
Without <i>alarm</i> option	XX

Options for Burst / Single-Cycle firing

11. Control options	Code
Voltage control (V ²)	V2
<i>Burst firing C16 only:</i> Voltage control (V ²) and current limit *	V2CL
Power control (V×I) and current limit *	VICL

12. Delay on first firing	Code
<i>Burst firing C16 or C64:</i> Transformer primary *	XFMR
Other configurations	NONE
<i>Single-cycle (FC1/ASC)</i>	XXXX

13. Type 1 alarms	Code
Serious Alarms: thyristor short-circuit, total load failure, over-temperature for ratings ≥ 125 A	GRF
Partial load failure and Serious Alarms	DLF
No alarms	NONE

14. Load type	Code
With <i>DLF</i> option: Short wave infrared elements Low temperature coefficient load	SWIR LTCL
Without <i>DLF</i> option or High temperature coefficient load	XXXX

15. Type 2 alarms	Code
Over-current alarm (<i>for DLF</i> option) * <i>except codes: SWIR, XFMR, VICL and V2CL</i>	ICO
No over-current alarm	NONE

16. Alarm relay contact	Code
With <i>alarm</i> option: Contact closed on alarm	NC
Contact open on alarm	NO
Without <i>alarm</i> option	XX

Communication and Certification

17 / 18 Communication options *	Code	19. Certification option	Code
Available later	NONE	No certificate of 'Compliance with Order'	NONE
		Certificate of 'Compliance with Order'	CFMC

* Available later

SAFETY DURING USE

- Eurotherm Limited shall not be held responsible for any damage, injury, losses or expenses caused by inappropriate use of the product or failure to comply with this manual. • The protective earth must be connected before any other connections are made and should be the last cable to be disconnected.
- The high speed fuse merely protects the thyristors. A suitable device must be fitted to protect the installation and isolate it from the supply, in accordance with applicable standards • The user must not attempt to access internal parts. Disconnect the unit before disassembling.
- Avoid touching the heatsink when the unit is operating and for 15 minutes after shutting down.

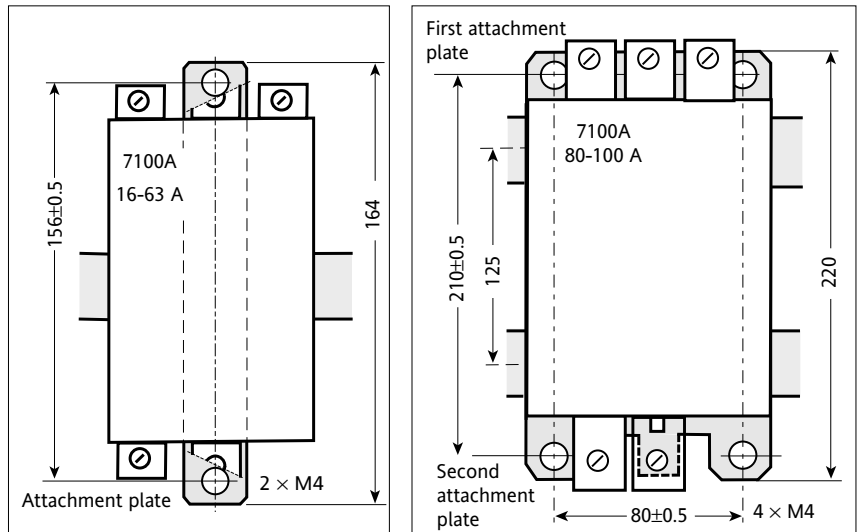
MOUNTING using attachment plate

Layout:

Leave a gap of at least 10 mm between adjacent units. Arrange units such that air from one unit is not drawn in by the unit above.

Mounting type: DIN rail or bulkhead mounting ($\geq 125\text{A}$ bulkhead mounting only).

Rating A	Attachment plate	Mounting	
		Symmetric DIN rails EN 50022 rails	Bulkhead Attachment screws
16 to 63	1 vertical plate	1 rail	2 × M4
80 and 100	2 horizontal plates	2 rails	4 × M4



WIRING

Power terminals (cage terminals): supply: **U1** and **V1**; load: **U2** and **V2**; protective earth: **PE**

Rating A	Terminal capacity	Tightening torque Nm
	mm ² / AWG	
16 to 25	2.5 / 13 to 6 / 9	1.2
40 to 63	6 / 9 to 16 / 5	1.8
80 to 100	16 / 5 to 35 / 2	3.8

The cross-section of conductors must correspond to the IEC 943 standard.

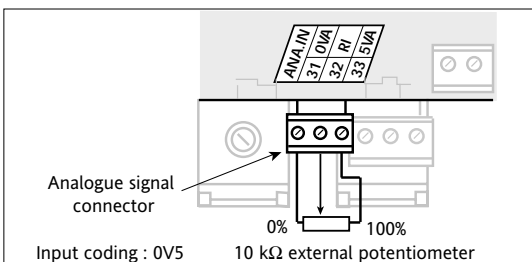
Control terminals

Terminal block	Terminal			
	No.	Label	Purpose	
ANA.IN	31	0VA	0 V analogue signal	Base
	32	RI	+ analogue signal	
	33	5VA	5 V user supply	
AUX	16	230	Auxiliary 230 V	
	17	115	or 115 V supply	
	18	N	Neutral or 2 nd phase	
ALARM	71	1a	Alarm relay contacts	Alarm Options
	72	1b		

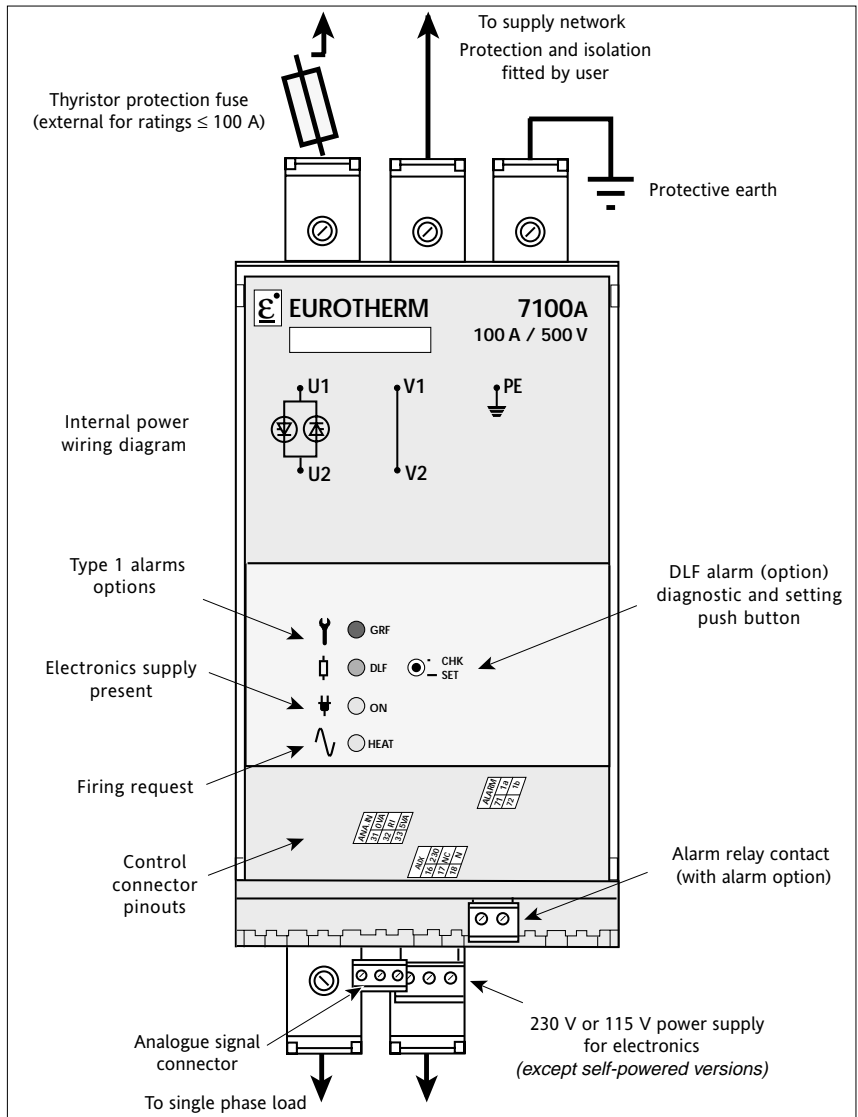
ANA.IN terminal capacity : 1.5 mm² / 16 AWG; tightening torque : 0.5 Nm.

AUX and ALARM terminal capacity : 2.5 mm² / 14 AWG; tightening torque : 0.7 Nm

Local analogue setpoint



CONNECTION DIAGRAM



Fuse without microswitch reference (code FUSE)

Rating	Fuse	With fuse-holder	Dimensions (mm) H x W x D
16 A	CH260024	FU1038/16A	81 x 17.5 x 94
25 A	CH260034	FU1038/25A	81 x 17.5 x 94
40 A	CH330054	FU1451/40A	97 x 26.5 x 86
63 A	CS173087U080	FU2258/63A	128 x 35 x 90
80 A	CS173087U100	FU2258/80A	128 x 35 x 90
100 A	CS173246U125	FU2760/100A	240 x 38 x 107

Fuse with microswitch reference (code MSFU)

Rating	Fuse	With fuse-holder	Dimensions (mm) H x W x D
16 A	CS176513U020	MSFU1451/16A	110 x 26.5 x 94
25 A	CS176513U032	MSFU1451/25A	110 x 26.5 x 94
40 A	CS176513U050	MSFU1451/40A	110 x 26.5 x 94
63 A	CS176461U080	MSFU2258/63A	127.5 x 35 x 96.5
80 A	CS176461U100	MSFU2258/80A	127.5 x 35 x 96.5
100 A	CS173246U125	MSFU2760/100A	240 x 53 x 107

TYPE 1 ALARMS (Options GRF or DLF)

The 7100S solid state contactors with 'Type 1 alarms' options (see Technical specification) can detect and indicate the serious alarms (GRF option) and the Load diagnostic alarm (DLF option).

Type 1 Alarms signalling

All faults detected are **signalled** by the alarm relay **contact** and the corresponding **LED** flashing on the 7100S solid state contactor front fascia. The indicators for the faults detected **return** to normal (LEDs and relay in non-alarm position) after the fault condition ceases. A push button enables the **partial load failure** alarm to be temporarily **bypassed**.

GRF OPTION

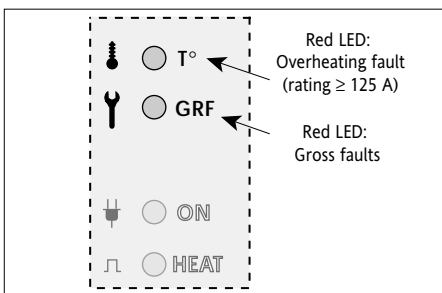
Alarms monitored with GRF option

The following alarms are detected with the **GRoss Faults** (serious alarms) option:

- Total Load Failure, **TLF**
- Thyristor Short Circuit, **THSC**
- Thyristor overheating, **T°** (only for fan-cooled units with current rating ≥ 125 A).

The **GRF** option (gross fault detection) is automatically **included** with the **DLF** option.

Layout of front panel LEDs with GRF option



Fault	LED status			Firing inhibit	Reaction time
	'T°' red	'GRF' red	'HEAT' green		
Total load failure (TLF) or Thyristor short circuit (THSC)	Off	On	On or flashing	No	2 s to 5 s
Overheating (T°)	On	Off	Off	Yes	

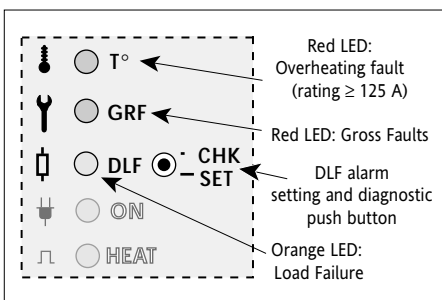
DLF OPTION

Alarms monitored with DLF option

With the **DLF** option the unit monitors and diagnoses the following faults:

- partial load failure, **PLF**
- gross faults, as with the GRF option

Layout of front panel LEDs with DLF option



Fault	LED state				Firing inhibit	Reaction time
	'T°' red	'GRF' red	'DLF' orange	'HEAT' green		
Partial load failure (PLF)	Off	Off	Flashing	On or Flashing	No	1 s to 10 s
Total load failure (TLF)	Off	On	Flashing			
Thyristor short-circuit (THSC)	Off	On	Off			
Overheating (T°)	On	Off	Off	Off	Yes	

Important !

- With the DLF option, the 'DLF' LED is used to distinguish between TLF and THSC faults.
- The DLF alarm signalling (LED and relay) can be temporarily reset using the push button. If the fault is still present, the DLF signalling LED returns to alarm status.
- The red 'T°' LED is only present for units with current rating ≥ 125 A and fitted with the **DLF** or **GRF** option.

With the **DLF** option, the load status monitoring circuit detects any abnormal increase in the load impedance, which may be caused by a partial (or total) failure of the heater elements (possibly connected in parallel).

The **DLF** diagnostic alarm presents the following functions:

- partial load failure (PLF) detection
- automatic PLF detection adjustment
- diagnosis of the state of this adjustment and the monitoring circuit
- disabling of DLF alarm monitoring or reset of DLF alarm signalling.

PLF detection is **adapted** to the load type.

The type of load controlled is selected when ordering, with the product code:

- **LTCL**, Low Temperature Coefficient resistive Load or
- **SWIR**, Short Wave InfraRed elements.

DIAGNOSTIC PARTIAL LOAD FAILURE ALARM (DLF)

• DLF alarm setting

The PLF detection setting involves calculating and storing the value of the reference impedance from the measured rms current and voltage values. This can be set using the **push button** on the front panel.

The PLF detection setting can only be adjusted (reference impedance calculated) in the following conditions:

- rms voltage across load greater than **40%** of the nominal voltage
- rms load current greater than **30%** of the rated current
- no overheating or thyristor short-circuit alarm.

• Partial load failure detection

PLF monitoring involves **comparing** the load impedance with a reference impedance stored during setting.

This comparison is used to detect an increase in the load impedance.

The load impedance is calculated continuously from the **measured** rms voltage and current values.

PLF **detection** is only possible under the following **conditions**:

- rms voltage across load greater than **40%** of the nominal voltage
- rms load current greater than **5%** of the rated current.

• Partial load failure detection sensitivity

Partial load failure detection sensitivity can be expressed in terms of a **maximum number** of load elements connected in parallel for which the unit can detect the failure of one element.

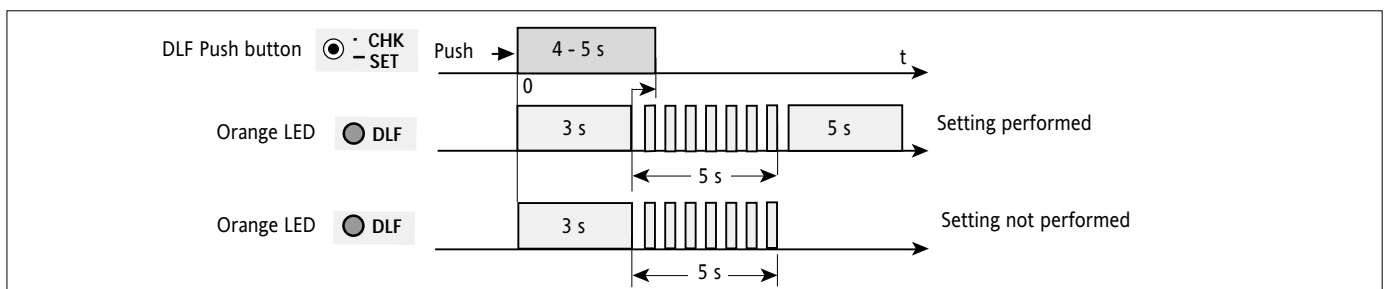
The DLF diagnostic alarm **guarantees** that failure of **ONE** element will be detected for **SIX** elements connected in parallel, corresponding to a **20%** increase in the load impedance relative to the reference impedance.

DLF ALARM PUSH BUTTON FUNCTIONS

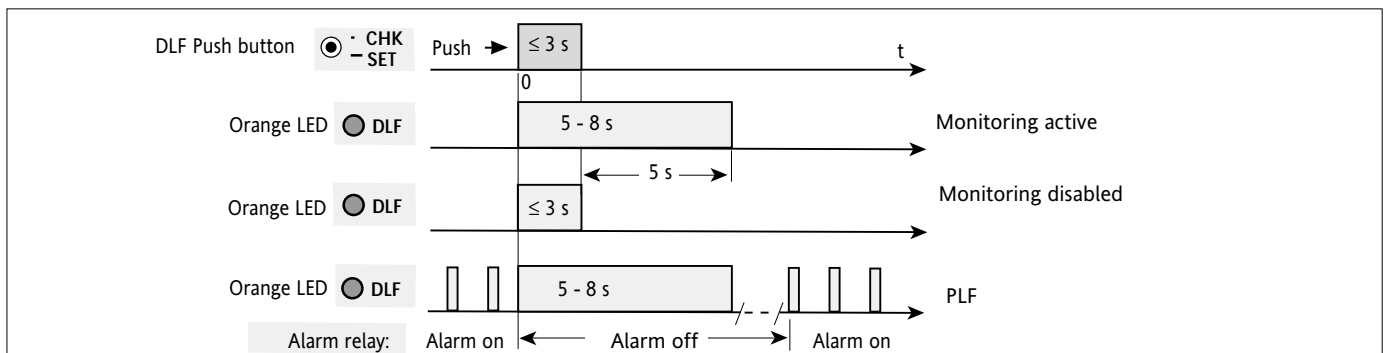
The push button on the front panel of the unit is labelled '**CHK / SET**' ('**C**hecking / **S**etting').

The various push on the push-button (to see diagrams below) sets and diagnoses the status of the PLF detection circuit.

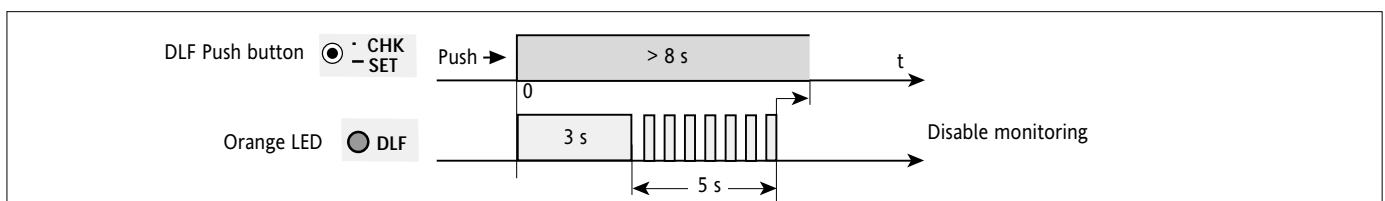
PLF detection setting request



PLF monitoring diagnosis



Disabling PLF monitoring



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