



SMART NAVIGATOR LM <46kV

Faulted Circuit Indicator for Overhead Lines - *Catalogue # 43-2016-XXX*

Description

The **Navigator LM (Load Memory)** is the latest generation of faulted circuit indicators, utilizing many years of experience, from the Horstmann Company.

Designed for overhead distribution circuits, the Navigator fault indicator quickly and accurately aids trouble crews in determining the status of the system and the location of faults. Installed on bare or covered conductor the unique design allows for easy installation and/or removal with a **hot stick or Grip All Tool**. These FCI's are held in place by an extremely strong spring loaded mechanism combined with serrated mounting surfaces, the Navigator can be mounted at any angle from vertical to horizontal.

The Navigator housing is sealed to operate in **adverse outdoor conditions**. The housing materials are corrosion and UV protected polyamide, polycarbonate and stainless steel. There are no moving mechanical parts to wear or fatigue, therefore trip current calibration remains constant throughout the life of the indicator. Attached to the housing is a conductive wire cage to provide additional protection to the internal electronic circuits of the **Navigator**.



The **SMART Navigator** is a version of the Standard Navigator Overhead Faulted Circuit Indicator that is designed and engineered for **Smart Grid – Distribution & Transmission Automation applications and Data Acquisition Equipment** such as **SCADA**.

The **SMART Navigator Cat# 43-2016-XXX** installs on overhead circuits $\leq 46kV$. For overhead circuits $>46kV$ & $\leq 161kV$ refer to the separate brochure for *Catalogue # 43-2118-XXX*.

SMART Navigators transmit event based fault information in addition to continuous circuit status information to either SCADA, email, SMS including the visual flash for field detection.

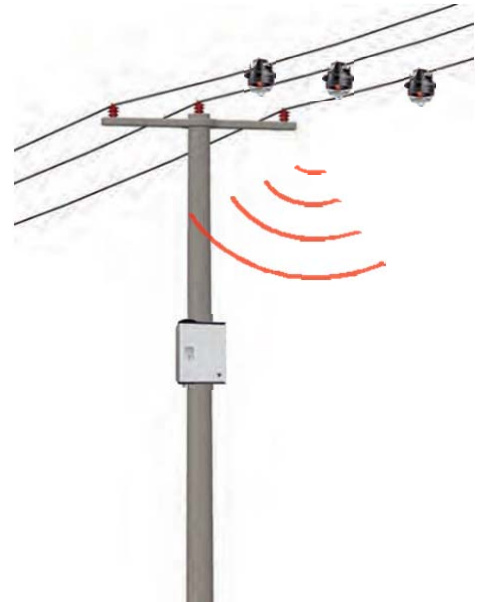
Event based data reports:	Continuous data reports:
<ul style="list-style-type: none"> • Fault detection • Momentary versus permanent fault • Fault current magnitude • Fault duration • Last good known load current • Time stamp 	<ul style="list-style-type: none"> • Routine call and health check • Battery status • Average load current • Peak and min. load current • Ambient temperature



The **SMART NAVIGATOR** can be integrated into an existing SCADA or any smart grid system and can operate in various communication environments such as; TCP/IP, RS232, Fiber, Cellular etc.. A pole mounted concentrator receives and manages all Navigator data as an access point into the chosen communication environment.

The **SMART NAVIGATOR** detects fault events and provides digital and analog fault data information for intelligent switching and restoration decisions. A conductor temperature sensor is also available as a Special order for use as an important diagnostic tool to evaluate line sag and potential hotspots.

The load leveling (LM) and load memory feature enables the unit to automatically set fault trip current rating in relation to peak load current. Once the unit detects fault current above its trip current rating the FCI sends a signal to the pole mounted concentrator and begins to flash a bright red blinking LED.



The **SMART Navigator** detects fault current in the same manner as the standard **Navigator LM** Overhead Indicator *Cat# 43-2001-100*. The feature of load leveling with load memory (LM) enables the unit to automatically set the fault trip threshold in relation to peak load current. Once the unit identifies fault current above its trip rating threshold, the **SMART Navigator** sends a signal to the **SMART Reporter**. In addition to supplying information through the communication network, local fault indication is provided by a bright red flashing LED. Low battery indication is provided by a bright yellow flashing LED when approximately 50 hours remain in the flash life of the indicator. This allows for scheduled replacement with a Battery Kit. Several combinations of reset methods are available including current, time and manual.

In addition to event based fault identification, the **SMART NAVIGATOR** also communicates fault data, load current and status data as required by the client.

Fault Indication Function

(Refer to time-current curves next page)

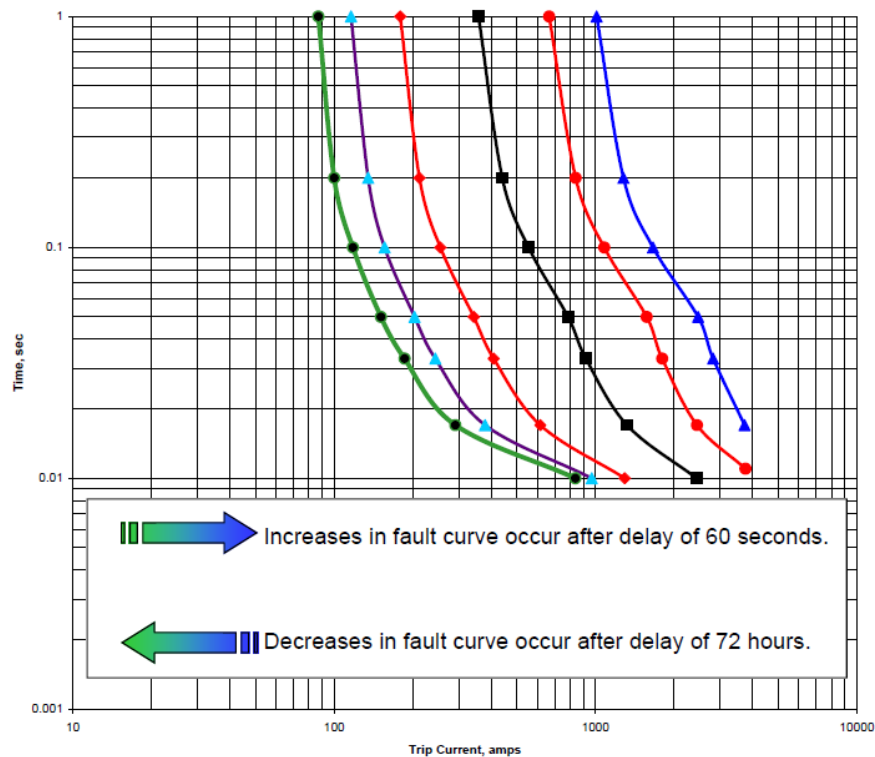
The Navigator has a single characteristic trip curve. The shape of the characteristic trip curve is referred to as Protection Mated. Protection Mated (PM) means the curve's shape is designed to coordinate with today's electronic protection devices and to avoid improper indication on circuit inrush. The Navigator constantly monitors the load current on the conductor and electronically adjusts the trip curve position accordingly. We refer to this action of self-adjusting as load tracking.



The initial or out of the box position of the trip curve is displayed on the next page. Its location is described by the time - current coordinates of 100 amps @ 200 ms. and the green color. This is the position of the trip curve for conductor amperages zero to thirty amps. The table located at the bottom of the figure shows data for other positions the curve would assume when currents larger than thirty amps are detected by the Navigator.

As an example; if 100 amps were detected then the curve would move horizontally to the right and assume the position at coordinates 440 amps @ 200 ms. (Black Squares). The relationship between conductor current and the trip position @ 200ms is non-linear. Load tracking begins at 30 amps, reaching its maximum adjusted value at 200 amps of load current. For load currents in excess of 200 amps the trip curve remains fixed at the 200 amp load current position of 1280 amps @ 200 ms. (Dark Blue Triangles). Keeping the curve fixed for load currents of 200 amps or more maintains coordination with upstream protection devices such as fuse links and breakers.

Load Memory (**LM**) describes how quickly the characteristic trip curve is adjusted. The highest continuous current sensed for at least 60 seconds will establish a trip curve position in memory and will be held there for 72 hours. If the load-current reaches or exceeds the stored value, a new trip curve position is registered and the memory retention time of 72 hours starts again. If load current does not meet or exceed this recorded level for 72 hours, the Navigator will then re-establish a new lower trip curve position.





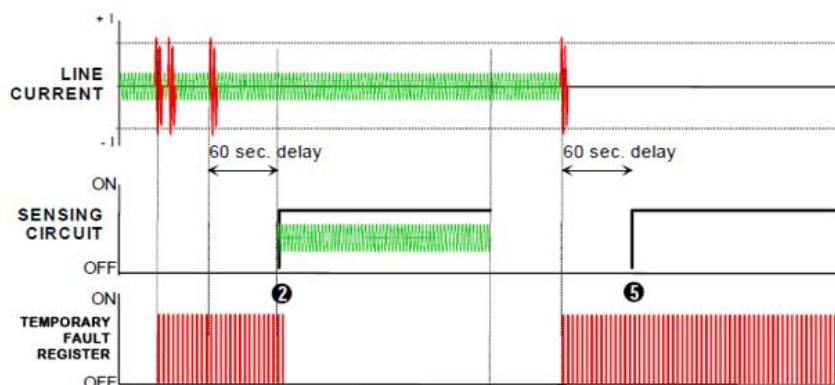
It should be noted that while the characteristic curve and load levelling position of the curve has been designed for today's protection devices, utility operating practices may dictate that load levelling will not coordinate in 100% of all operational circumstances. For those cases a (non-adjusting) PM curve of fixed magnitude can be provided.

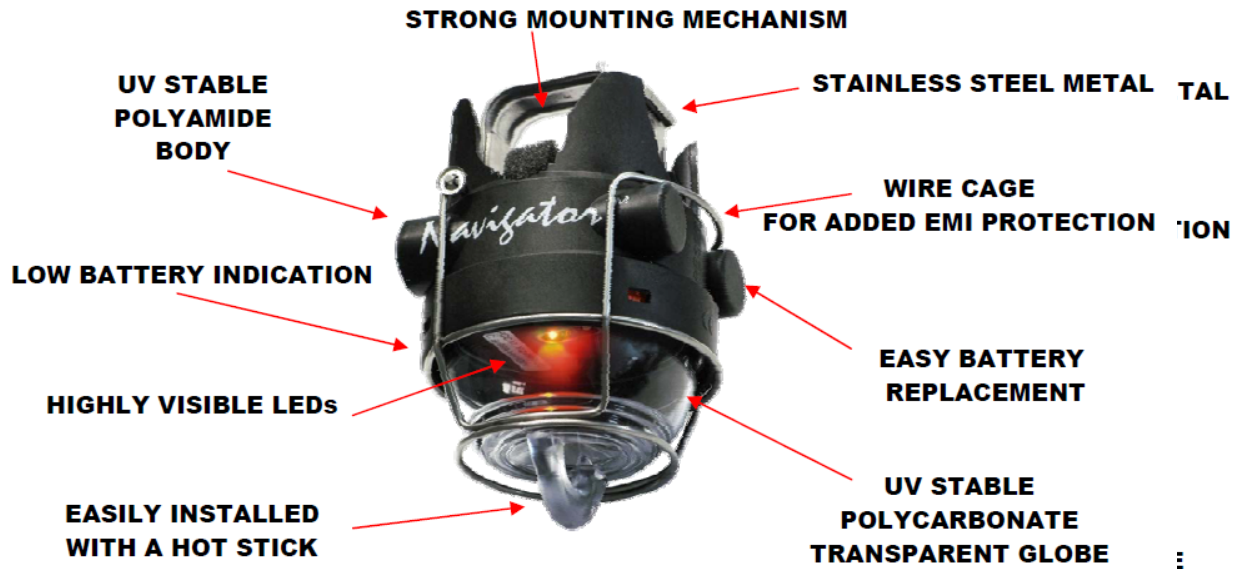
EXPLANATION OF PERMANENT & TEMPORARY FAULT DETECTION (below)

1. THE SMART NAVIGATOR IN RESPONSE TO THE FAULT, SENDS THE EVENT RECORD IN BOTH TEMPORARY & PERMANENT FAULT REGISTERS TO THE DNP3 RECEIVER WHILE A "RED" FLASHING STROBE LIGHT FLASHES LOCALLY.
2. 60 SECONDS AFTER LAST RECORDED FAULT, A CIRCUIT SENSES FOR $>3A$, 60 Hz. RESPONDING TO CURRENT THE SENSING CIRCUIT RESETS THE TEMPORARY REGISTER.
3. THE PERMANENT REGISTER "RED" LIGHT REMAINS ON FOR 4 HOURS, UNLESS MANUAL RESET OCCURS FIRST.
4. AFTER 4 HOURS HAVE ELAPSED, THE PERMANENT REGISTER AND "RED" LIGHT IS RESET LOCALLY.
5. THE SMART NAVIGATOR, IN RESPONSE TO THE FAULT, RECORDS THE EVENT IN BOTH TEMPORARY & PERMANENT FAULT REGISTERS OF THE DNP3.
6. 60 SECONDS AFTER FAULT, CIRCUIT SENSES FOR $>3A$, 60 Hz. IF NO CURRENT IS DETECTED, THE REGISTER REMAINS ACTIVATED FOR 4 HOURS, OR UNTIL CURRENT IS SENSED. IF CURRENT IS SENSED AFTER 60 SECONDS, THE TEMPORARY REGISTER IS TRIGGERED IN THE DNP3. WHEN CURRENT IS SENSED AFTER 60 SECONDS, THE PERMANENT REGISTER IS DISPLAYED IN THE DNP3. THE LOCALLY SET "RED" LIGHT REMAINS ON FOR 4 HOURS OR UNTIL RESET REMOTELY OR LOCALLY WITH A MAGNET.

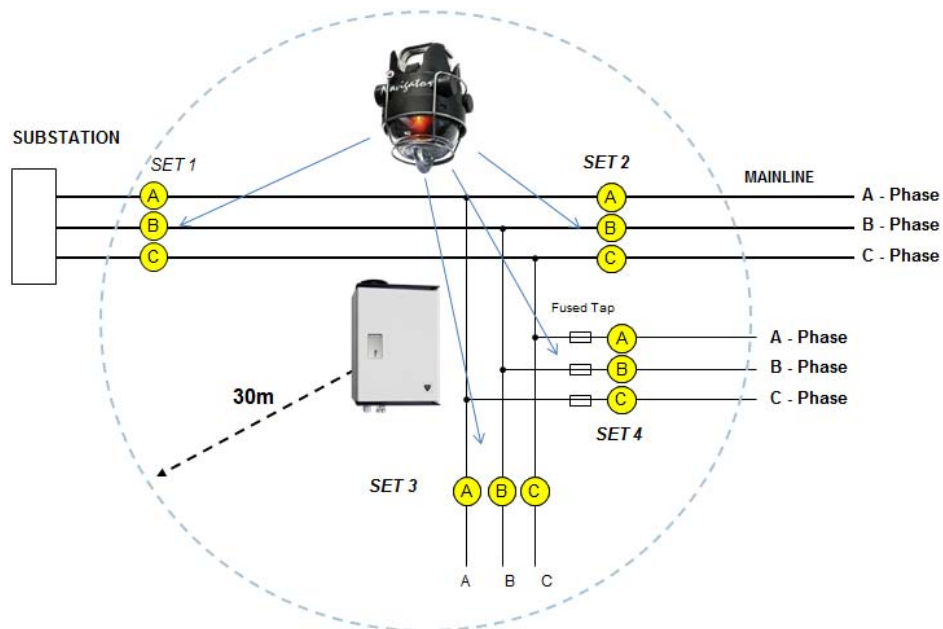
NOTE:

Unlike the **Standard Navigator LM**, the amber light is not part of the "temporary" register for field identification. The reason for this is, identification has already been made by the SCADA System as to location and phase involved. If a field identifier is necessary, the FCI can be triggered for identification remotely. This extends the battery life tremendously.





Communication Function





The **SMART Navigator** communicates bi-directionally via Modbus with a nearby SMART Receiver over a 2.4GHz radio frequency transmission.

Up to **12** separately addressable **SMART Navigators** can communicate with one receiver.

Event based reporting (by exception)

- TRIP / Fault Indication (Radio and LED)
- Fault Indication (Tripped FCI)
- Distinction between momentary and permanent faults (60s delay)
- Fault Current Magnitude and Duration
- Last Good Known Current (1s prior Fault)
- Reset of FCI (Local indication resets)

Other Events:

- Current Loss
- Low Battery Alarm
- COMM Fail (Generated by the Receiver)
- Synchronized Time stamp
- Continuous reporting
- Load Current Monitoring (15 Min values)
- Peak load current
- Average load current
- Minimum load current
- Temperature
- Device Temperature (Ambient)
- Conductor Temperature* (* = Option)
- Fault Counter (Momentary & Permanent)
- Health Check Signal 15 minute reporting interval

Refer to separate documentation or nearest sales office for available receiver output options to SCADA.

Please consult with your local sales representative.



LaPrairie, a Division of WESCO Distribution
 1206 Ringwell Drive, Units# 5-6
 Newmarket, Ontario L3Y 8V9
 Tel: 905-830-9975

	NAVIGATOR-LM	SMART NAVIGATOR + SMART REPORTER
≤46 kV		
	NAVIGATOR-LM HV	SMART NAVIGATOR HV + SMART REPORTER
≤161 kV		

Order Numbers for the “Smart Reporter” to go with the Smart Navigators (below)

CUSTOMER - Part Numbers		(this sheet for clients)									
Description	Order No new	New Size	AC	PMU	Router	Heater	Puck	Ext.- Antenna Connection	Door Contact	Batteries	
SMART REPORTER 3.0, AC, PMU, Router, Heater	28-3011-002	250x350x150	*	*	*	*	*	*	*	1	
SMART REPORTER 3.0, AC, PMU, Heater, no puck	28-3011-004	250x350x150	*	*		*		*	*	1	
SMART REPORTER 3.0, AC, PMU, Heater	28-3111-001	300x400x200	*	*		*	*	*	*	1	
SMART REPORTER 3.0, AC, PMU, Router, Heater	28-3111-002	300x400x200	*	*	*	*	*	*	*	1	
SMART REPORTER 3.0, AC, PMU, Heater	28-3111-003	300x400x200	*	*		*		*	*	1	
SMART REPORTER 3.0, AC, PMU, Heater, SEL Box	28-3211-001	400x400x200	*	Battery Charger		*	*	*	*	2	
Smart DNP3 Version 3.0 Only!	28-6223-300										
Smart FCI's Version 3 Only	43-2016-100										



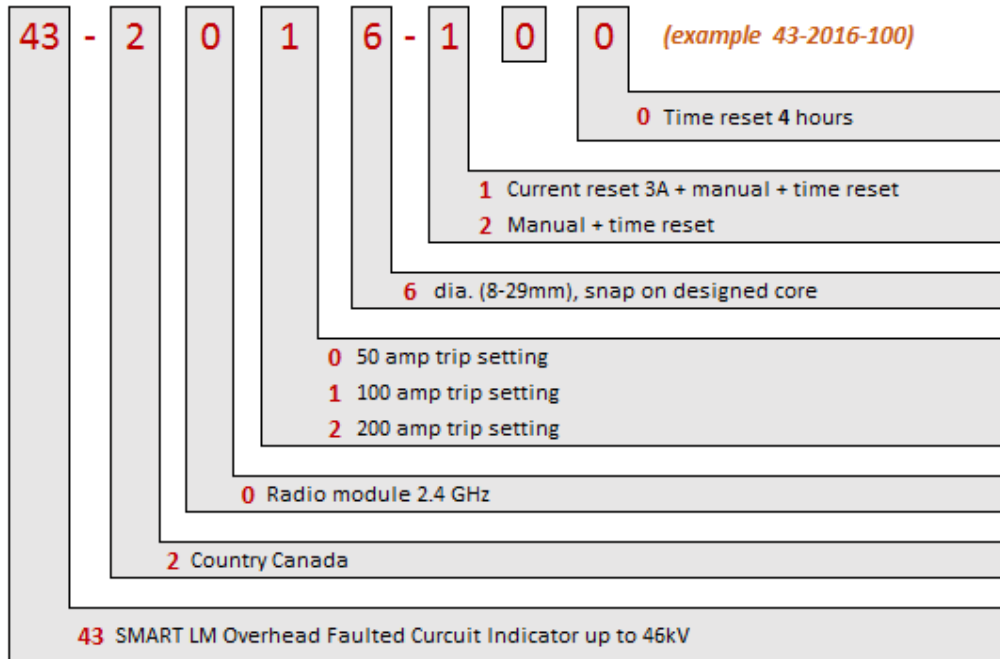
Electrical Data	Corresponding to ANSI / IEEE Std 495-2007
Trip current (unleveled)	50 A - 1200 A / 200 ms (see trip setting options)
Local indication / Flashing frequency	Super bright red LED / 30 per minute
Current reading range	3 A to 10 kA
Load tracking	Initiated with load current ≥ 20 A
Temperature range	-30 up to +70° C (ANSI test -40 up to +85° C passed)
Accuracy	≥ 100 A $\pm 10\%$ @ 20° C
Trip factor	4 times load current @ 200ms
Level delay	60 sec.
Level memory	72 hours
Function test / reset	by use of permanent magnet
Automatic time reset	4 hours 'standard' (Factory set. Other reset times optional.)
Current reset	≥ 3 A
Power source	2 Lithium - Batteries, replaceable, 20 years shelf life
Maximum operating voltage / Frequency	46 kV / 60 Hz
Current withstand	25 kA ms / 1 s
Transmitter Data:	
Frequency / Power / Modulation	2.4 GHz / 1 mW / MSK
Range	> 100 ft. (30 m) installed on overhead
Distinction of different units	Addressing dependent upon registration sequence with receiver
Mechanical Data:	
Cable diameter range	8 mm - 29 mm 'standard'
Casing material	PA / PC; UV stable
Current transformer	Closed core
Weight	420 g
EMI	IEC 61000-4-2 (ESD), IEC 61000-4-3 (HF)
Catalog no.:	43-2016-XXX



SMART OH LM , <46kV - Catalogue Ordering Instructions

September 25, 2015 - DT, Brews Supply

Document Number - 41-000-000





CAUTION!

Clamping mechanism is powered by **EXTREMELY STRONG SPRINGS**. Once set in the open position, the clamping mechanism is easily triggered. To avoid injury, keep hands and fingers away from clamping area as much as possible.

- 1** Open clamp with your hand until engaged in plastic groove.



- 2** Engage hook stick on bail of indicator.



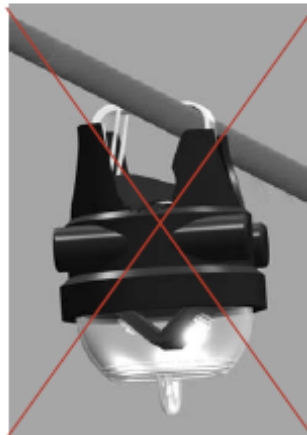
- 3** Position indicator on conductor through opening.



- 4** Thrust indicator up on to conductor until fully clamped..



- 5** In **CORRECT** clamped position.



- 6** **INCORRECTLY** Installed.



- 7** Remove hot stick.