

Flow Measurement SITRANS F US Clamp-on

SITRANS FUH1010 (Oil)

Overview



SITRANS FUH1010 clamp-on non-intrusive ultrasonic flowmeter is ideal for applications carrying crude oil, refined petroleum or liquefied gas.

SITRANS FUH1010 has three application areas: Interface detectors, precision volume or standard volume flowmeters.

Benefits

For all SITRANS FUH1010 products

- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external sensors do not require periodic cleaning
- No moving parts to foul or wear
- No pressure drop or energy loss
- Wide turn-down ratio, 30:1
- Choice of single, dual, or optional, three or four path versions.
 - Single path version reduces initial investment
 - Two or optional three and four path versions provide higher accuracy, especially where limited straight run or poor flow profile exists
- WideBeam technology
 - Helps provide improved accuracy over a wide range of liquid conditions and flow rates
 - Accommodates pipelines transporting multiple liquid products
- ZeroMatic Path automatically corrects for zero drift without stopping flow

Interface detection

- Outputs liquid density and API as a direct replacement for intrusive densitometers
- Exceptional repeatability is maintained, independent of changes in temperature, pressure or viscosity
- No need for straight run

Precision volume

- Moderate cost
- Precise measurement is maintained with automatic "Reynolds Number" compensation for temperature and viscosity changes.

Standard volume

- Exceptional repeatability is maintained, independent of changes in temperature, density or viscosity
- Batch interface and product quality diagnostics provided
- Density and API outputs provided
- Scraper („pig“) detection provided

Application

Interface detection

- Precise identification of interfaces on multi-liquid pipelines
- Rapid and precise scraper "pig" indication
- Product identification
- Density indication

Precision volume

- Applications with multiple liquids having a wide viscosity range
- Automatic gross volume compensation due to viscosity changes

Standard volume

- Standard (net) volume flow measurement
- Suitable for use in leak detection systems
- Mass flow output measurement
- Interface detection
- "Pig" detection
- Chemical and petrochemical processing

Design

SITRANS FUH1010 is available in three enclosures:

- IP65 (NEMA 4X) wall mount enclosure constructed of fiber-glass reinforced polyester with stainless steel hardware and polyester keypad
 - Single path
 - Dual path
 - Optional four path
- IP65 (NEMA 7) compact explosionproof enclosure constructed of cast aluminum with glass window, stainless steel hardware
 - Single path
 - Dual path (option)
- IP66 (NEMA 7) wall mount explosionproof enclosure constructed of cast aluminum, stainless steel hardware, with glass window
 - Single path
 - Dual path
 - Four path (optional)
- There are 2 types of mounting assemblies
 - Aluminum mounting frames (default)
 - Stainless steel weld seal (optional)

Function

- IP65 (NEMA 4X) and IP66 (NEMA 7) flowmeters have integral 33 button keypads and large (128 x 240 pixel) graphic displays visible up to 12 m (40 ft) away
- IP65 (NEMA 7) compact explosionproof flowmeter has a 2 x 16 alpha-numeric LCD display
- Current, voltage, status alarm, frequency and RS 232 outputs (see specification section for details)
- Analog inputs (see specification section for details)
- ZeroMatic Path automatically corrects for zero drift
- Bidirectional flow operation
- 1 MByte data logger with both site and data logger storage
- English, Spanish, German, Italian and French language options

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Technical specifications

Specifications for interface detectors

Accuracy

Accuracy	± 0.05 of API No.
Repeatability	± 0.01 of API No.

Specifications for volumetric and mass flowmeters

Input

Flow range	± 12 m/s (± 40 ft/s), bidirectional
Flow sensitivity	0.0003 m/s (0.001 ft/s), flow rate independent

Accuracy

Typical accuracy	± 0.5 to 1 % of flow
Calibratable accuracy	± 0.15 % ... 0.3 % of flow, depending on version
Batch repeatability	± 0.05 % of flow, maximum

Specifications for all SITRANS FUH1010 products

Input

Pipe size	6.4 mm ... 9.14 m (0.25" ... 360")
Analog inputs	• Current: 4 x 4 ... 20 mA (IP65 (NEMA 7) enclosure has (2))

Output

Standard outputs	• Current: 4 x 4 ... 20 mA (1 kΩ at 30 VDC) • Voltage: 2 x 0 ... 10 V DC (5 kΩ minimum) (None for IP65 (NEMA 7) enclosure) • 1 x 0 ... 5 kHz Pulse Rate, Digital Quad. (None for IP65 (NEMA 7) enclosure) • RS 232 Serial Port
Extended outputs	• MODBUS (not for IP65 (NEMA 7) enclosure) • Up to 4 x additional 4 ... 20 mA (not for IP65 (NEMA 7) enclosure) • 4 x form C relays (not for IP65 (NEMA 7) enclosure) • Up to 4 x digital pulse (not for IP65 (NEMA 7) enclosure)
Status/Alarm I/O	• 4 x Programmable relays (not for IP65 (NEMA 7) enclosure) • 2 x Optically coupled output logic gates (for IP65 (NEMA 7) enclosure, only) • 1 x Totalizer clear switch input (not for IP65 (NEMA 4X) enclosure)¹⁾ • 1 x Totalizer hold switch input (not for IP65 (NEMA 7) enclosure)¹⁾ • 1 x Opto iso. totalizer clear switch input (for IP65 (NEMA 7) enclosure, only)¹⁾ • 1 x Opto iso. totalizer hold switch input (for IP65 (NEMA 7) enclosure, only)¹⁾

Accuracy

Zero Drift	0.0003 m/s (0.001 ft/s), with ZeroMatic Path active (not provided for interface detector)
Data refresh rate	5 Hz

Rated operation conditions

Degree of protection	IP65 (NEMA 4X)
• Wall mount	IP65 (NEMA 7)
• Compact explosionproof	IP66 (NEMA 7)
• Wall mount explosionproof	
Liquid temperature	
• Standard	-40 ... +120 °C (-40 ... +250 °F)
• Optional	-40 ... +230 °C (-40 ... +450 °F)
Ambient temperature	-18 ... +60 °C (0 ... 140 °F)

Design

Dimensions	see SITRANS F US Clamp-on "System info and selection guide"
Weight	see diagrams

Power supply

• IP65 (NEMA 4X) wall mount and IP66 (NEMA 7) wall mount explosionproof	90 ... 240 V AC, 50 ... 60 Hz, 30 VA or 9 ... 36 V DC, 12 W
• IP65 (NEMA 7) compact explosionproof	90 ... 240 V AC, 50 ... 60 Hz, 15 VA or 9 ... 36 V DC, 10 W

Indication and operation

Data logger memory	1 MByte
Display	
• IP65 (NEMA 4X) and IP66 (NEMA 7) Enclosures	128 x 240 pixel LCD with back-light
• IP65 (NEMA 7) Enclosure	2 x 16 Alphanumeric LCD Display
Keypad	
• IP65 (NEMA 4X) and IP66 (NEMA 7) Enclosures	33 keypad buttons with tactile feedback
• IP65 (NEMA 7) Enclosure	5 Magnetic hall effect switches
Language options	English, Spanish, German, Italian, French

¹⁾ Totalizer switch inputs are not provided for the interface detector.

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Certificates and approvals

IP65 (NEMA 4X) wall mount enclosure

FM and CSA

CE

C-TICK

ATEX

INMETRO (Brazil)

IECEX

IP65 (NEMA 7) compact explosion-proof enclosure ratings

FM and CSA

CE

C-TICK

ATEX

INMETRO (Brazil)

IECEX

- Transmitter
N-I Class I, Div 2
S Class II, Div 2
Sensor

- I.S. Class I, II, Div 1

EMC Directive 2004/108/EC
ATEX Directive 94/9/EC

- Transmitter:
Ex II (1) G [Ex ia] IIC
Ex II 3 (1) G Ex nC [ia] IIC T5
- Sensors:
Ex II 1 G Ex ia IIC T5

- Transmitter:
[BR-Ex ia] IIC
BR-Ex nC [ia] IIC T5

- Sensors:
BR-Ex ia IIC T5

Pending

- Transmitter
XP Class I, Div 1
D-I Class II, Div 1
N-I Class I, Div 2
S Class II, Div 2
Sensor
- I.S. Class I, II, Div 1

- EMC Directive 2004/108/EC
• ATEX Directive 94/9/EC

- Transmitter:
Ex II 2 (1) G Ex d [ia] IIB + H2 T5
- Sensors:
Ex II 1 G Ex ia IIC T5

- Transmitter:
BR-Ex d [ia] IIC T5
- Sensors:
BR-Ex ia IIC T5

Pending

IP66 (NEMA 7) wall mount explosionproof enclosure ratings

FM and CSA

CE

ATEX

INMETRO (Brazil)

IECEX

- Transmitter
XP Class I, Div 1
D-I Class II, Div 1
N-I Class I, Div 2
S Class II, Div 2
Sensor

- I.S. Class I, II, Div 1

EMC Directive 2004/108/EC
ATEX Directive 94/9/EC

- Transmitter:
Ex II (1) G [Ex ia] IIC
Ex II 3 (1) G Ex nC [ia] IIC T5
Ex II 2 (1) G Ex d [ia IIC] IIB + H2 T5

- Sensors:
Ex II 1 G Ex ia IIC T5

- Transmitter:
[BR-Ex ia] IIC
BR-Ex d [ia IIC] IIB T5

- Sensors:
BR-Ex ia IIC T5

Pending

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Standard MLFB for quick delivery on SITRANS FUH1010 (Oil)

Selection and Ordering data	Article No.	Order code
SITRANS FUH1010 (Oil)	7ME360	0 - K12 + K12 + R12
Design		
IP65 (NEMA 4X) wall mount	0	
Number of ultrasonic paths/meter type	4	
Dual path Standard Volume		
Flowmeter functions and I/O configurations	A	
includes graphic or digital display, IP66 (BNB6665 (NEMA 4X)) and IP66 (NEMA 7) wall mount explosionproof units:		
Standard		
• Graphic display		
• 4 x 4 ... 20 mA analog input		
• 2 x 0 ... 10 V		
• 2 x 4 ... 20 mA		
• 2 x pulse outputs		
• 4 x form C relays		
• 2 x RTD input		
Meter power options	A	
90 ... 240 V AC		
Communication options	0	
RS 232 (standard)		
RTD temperature sensor		
(includes mounting hardware for pipes above 1.5"/38 mm OD)		
No RTDs	0	
1 x standard clamp-on RTD	1	
2 x standard clamp-on RTD	2	
1 x submersible clamp-on RTD	3	
2 x submersible clamp-on RTD	4	
Notes:		
1. Temperature input is required for SITRANS FUH1010 systems		
2. Only the Interface detector set up as a dual channel can use 2 RTD's		
Sensor for channel 1		
(includes pipe mounting kit and spacer bar for indicated max. outer diam. listed)		
no sensor	A	
C2H (high precision)	N	
Mounting frame and straps provided up to 1200 mm (48")		
D1H (high precision)	P	
Mounting frame and straps provided up to 1200 mm (48")		
D4H (high precision)	R	
Mounting frame and straps provided up to 1200 mm (48")		
D1H (high precision)	Z	P1P
High Temperature to 104 °C/219 °F		
Sensor for channel 2		
(includes pipe mounting kit and spacer bar for indicated max. OD listed)		
See "Sensor selection charts" for specifications.		
no sensor	A	
C2H (high precision)	N	
Mounting frame and straps provided up to 1200 mm (48")		
D1H (high precision)	P	
Mounting frame and straps provided up to 1200 mm (48")		
D4H (high precision)	R	
Mounting frame and straps provided up to 1200 mm (48")		
D1H (high precision)	Z	Q1P
High Temperature to 104 °C/219 °F		
Approvals		
FM/CSA/CE (default)	1	
ATEX, CE, C-TICK	2	
Standard MLFB product offering represents 4 to 6 weeks delivery time		
For sensor and RTD cables for quick delivery see tables at end of section.		

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Selection and Ordering data	Article No.	Ord. code	Selection and Ordering data	Article No.	Ord. code
SITRANS FUH1010 (Oil)			SITRANS FUH1010 (Oil)		
- IP65 (NEMA 4X) wall mount - IP65 (NEMA 7) compact explosionproof - IP66 (NEMA 7) wall mount explosionproof	7ME3600- 7ME3601- 7ME3603-		- IP65 (NEMA 4X) wall mount - IP65 (NEMA 7) compact explosionproof - IP66 (NEMA 7) wall mount explosionproof	7ME3600- 7ME3601- 7ME3603-	
Number of ultrasonic paths/meter type			RTD temperature sensor (includes mounting hardware for pipes above 1.5" OD)		
Single path (precision volume)	0		No RTDs (Note: temperature input is required for SITRANS FUH systems)	0	
Single path (interface detector)	1		1 x Standard clamp-on RTD	1	
Dual channel/Dual path (interface detector)	2		2 x Standard clamp-on RTD ²⁾	2	
Dual path (precision volume)	3		1 x Submersible clamp-on RTD	3	
Dual path (standard volume/mass)	4		2 x Submersible clamp-on RTD ²⁾	4	
Special: Four path (standard volume/mass) only	9	H 1 A			
Flowmeter functions and I/O configurations			Sensor for channel/path 1 (includes standard pipe mounting kit and spacer bar for indicated max. outer diameter listed) See "Sensor selection charts" for specifications.		
Includes graphic or digital display			no sensor	A	
IP65 (NEMA 4X) wall mount and IP66 (NEMA 7) wall mount explosionproof units			For the following A1H to D4H sensors, temperature range is -40 °C to 65 °C (-41 °F to 150 °F), nominal 21 °C (70 °F):		
- Standard - Graphic display 4 x 4 ... 20 mA analog input 2 x 0 ... 10 V 2 x 4 ... 20 mA analog output 2 x pulse output 4 x form C relay 2 x RTD input - Extended I/O option - additional 2 x 4 ... 20 mA outputs - Form C relays 4 x digital pulse outputs (2 x open collector and 2 x 0 ... 5 V TTL)	A		A2H (high precision) Trackmount and straps provided up to 75 mm (3")	H	
	C		A3H (high precision) Trackmount and straps provided up to 75 mm (3")	J	
	D		B1H (high precision) Trackmount and straps provided up to 125 mm (5")	K	
	F		B2H (high precision) Trackmount and straps provided up to 125 mm (5")	L	
			B3H (high precision) Trackmount and straps provided up to 125 mm (5")	T	
			C1H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	M	
			C2H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	N	
			D1H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	P	
			D2H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	Q	
			D3H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	U	
			D4H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	R	
Meter power options					
90 ... 240 V AC	A				
9 ... 36 V DC (except compact NEMA 7)	B				
9 ... 36 V DC negative GND (compact only)	J				
9 ... 36 V DC positive GND (compact only)	K				
Communication options					
RS 232 (standard)	0				
Standard MODBUS configurations include Baudrate: 9600, Parity: None, Stop Bits: 1, Data bits: 8, MODBUS data: 16 bit, Data format: word normal, Mode: RTU, and MODBUS format: Gould. For other configurations please select option 9 and L1Y and state requirements in plain text					
MODBUS (excludes NEMA 7 compact)	1				
Other Version, MODBUS, N2, Other Baud Rate, Other Parity, State in Plain Text	9				

¹⁾ Supplied spacer bar supports pipes up to 750 mm (30 inch). For pipes larger than 750 mm (30 inch) purchase also, spare part 7ME3960-0MS40 (1012BN-4).

²⁾ Dual channel interface detector only

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Selection and Ordering data	Article No.	Ord. code	Selection and Ordering data	Article No.	Ord. code
SITRANS FUH1010 (Oil)			SITRANS FUH1010 (Oil)		
• IP65 (NEMA 4X) wall mount • IP65 (NEMA 7) compact explosionproof • IP66 (NEMA 7) wall mount explosionproof	7ME3600-		• IP65 (NEMA 4X) wall mount • IP65 (NEMA 7) compact explosionproof • IP66 (NEMA 7) wall mount explosionproof	7ME3600-	
	7ME3601-			7ME3601-	
	7ME3603-			7ME3603-	
	0 -			0 -	
Sensor for channel/path 1 (continued)			For the following B1H to D4H sensors, temperature range is -1 °C up to 104 °C (30 °F up to 220 °F), nominal 65 °C (150 °F):		
B1H (high temperature range HP)	Z	P 1 K	B1H (high temperature range HP)	Z	Q 1 K
B2H (high temperature range HP)	Z	P 1 L	B2H (high temperature range HP)	Z	Q 1 L
B3H (high temperature range HP)	Z	P 1 T	B3H (high temperature range HP)	Z	Q 1 T
C1H (high temperature range HP)	Z	P 1 M	C1H (high temperature range HP)	Z	Q 1 M
C2H (high temperature range HP)	Z	P 1 N	C2H (high temperature range HP)	Z	Q 1 N
D1H (high temperature range HP) ¹⁾	Z	P 1 P	D1H (high temperature range HP) ¹⁾	Z	Q 1 P
D2H (high temperature range HP) ¹⁾	Z	P 1 Q	D2H (high temperature range HP) ¹⁾	Z	Q 1 Q
D3H (high temperature range HP) ¹⁾	Z	P 1 U	D3H (high temperature range HP) ¹⁾	Z	Q 1 U
D4H (high temperature range HP) ¹⁾	Z	P 1 R	D4H (high temperature range HP) ¹⁾	Z	Q 1 R
Sensor for channel/path 2			Approvals		
(includes pipe mounting kit and spacer bar for indicated max. outer diameter listed)			FM/CSA/CE/C-TICK (default), also for non hazardous area	1	
See "Sensor selection charts" for specifications.			ATEX	2	
no sensor		A	INMETRO (Brazil)	3	
For the following A1H to D4H sensors, temperature range is -40 °C to 65 °C (-41 °F to 150 °F), nominal 21 °C (70 °F):			¹⁾ Supplied spacer bar supports pipes up to 750 mm (30 inch). For pipes larger than 750 mm (30 inch) purchase also, spare part 7ME3960-0MS40 (1012BN-4).		
A2H (high precision) Trackmount and straps provided up to 75 mm (3")	H				
A3H (high precision) Trackmount and straps provided up to 75 mm (3")	J				
B1H (high precision) Trackmount and straps provided up to 125 mm (5")	K				
B2H (high precision) Trackmount and straps provided up to 125 mm (5")	L				
B3H (high precision) Trackmount and straps provided up to 125 mm (5")	T				
C1H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	M				
C2H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	N				
D1H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	P				
D2H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	Q				
D3H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	U				
D4H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾	R				

Selection and Ordering data	Order code
Further designs	
Please add "-Z" to Article No. and specify Order code(s).	
Cable assembly for sensors (add for # of paths)	
See "Sensor cable selection chart"	K..
Cable assembly for RTDs (add for # of RTDs)	
See "RTD cable selection chart"	R..
Cable termination kit (for one cable pair)	
• Termination for standard, plenum and armored sensor cable	T01
• Termination for submersible cable	T11
• RTD cable termination kit for standard RTD	T21
• RTD cable termination kit for submersible RTD	T31
Languages (Meter and Documentation), English (default)	
• German	B10
• French	B12
• Spanish	B13
• Italian	B14
Tag name plate	
• Stainless steel tags with 3.2 mm (0.13 inch) characters (68 characters max.)	Y19

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Selection and Ordering data	Article No.
Operating Instructions for SITRANS FUH1010	
English NEMA 4X & NEMA 7 wall mount Standard Volume	A5E02951449
German NEMA 4X & NEMA 7 wall mount Standard Volume	A5E02951529
English NEMA 4X & NEMA 7 wall mount explosionproof Precision Volume	CQO:1010PVNFM-3
English NEMA 4X & NEMA 7 wall mount explosionproof Interface Detector	A5E02951504
English NEMA 7 compact explosionproof Standard Volume	CQO:1010DVXFM-3
English NEMA 7 compact explosionproof Precision Volume	CQO:1010PVXFM-3
English NEMA 7 compact explosionproof Interface Detector	CQO:1010BXXFM-3
This device is shipped with a Quick Start Guide and a CD containing further SITRANS F literature.	
All literature is also available for free at: http://www.siemens.com/flowdocumentation	

MLFB example

Application example

A clamp-on meter is required for a 12" carbon steel hydrocarbon line flowing multiple products, with a wall thickness of 12.7 mm (0.5"). Meter electronics are to be located in a Class I Div 2 area only 60 ft from the pipeline. 12 V DC power is available at the site.

Dual path operation is desired for improved accuracy and redundant measurement. Pulse output will be primary flow data source.

MLFB Article No.: **7ME3600-3CB00-3QQ1-Z**
K03 + K03 + R03

Selection and Ordering data	Article No.	Ord. code
SITRANS FUH1010 meter family	7 ME 3 6 0 -	
IP65 (NEMA 4X) enclosure	0	
Dual path precision volume	3	
Custody Transfer option with digital pulse	C	
9 ... 36 V DC power option	B	
RS 232 Standard	0	
RTD required for viscosity comp	3	
Sensor code for path 1	Q	
Sensor code for path 2	Q	
FM approval required	1	
30 m (100 ft) sensor cable for path 1		K 0 3
30 m (100 ft) sensor cable for path 2		K 0 3
30 m (100 ft) cable for RTD		R 0 3

High precision sensor selection chart IP68

Based on pipe wall thickness (steel pipes only)					
Sensor	Order Code	Pipe wall (mm)		Pipe wall (inch)	
Pipe wall		min.	max.	min.	max.
A1H	G	0.64	1.02	0.025	0.04
A2H	H	1.02	1.52	0.04	0.06
A3H	J	1.52	2.03	0.06	0.08
B1H	K	2.03	3.05	0.08	0.12
B2H	L	3.05	4.06	0.12	0.16
C1H	M	4.06	5.84	0.16	0.23
C2H	N	5.84	8.13	0.23	0.32
D1H	P	8.13	11.18	0.32	0.44
D2H	Q	11.18	15.75	0.44	0.62
D4H	R	15.75	31.75	0.62	1.25
B3H	T	2.7	3.3	0.106	0.128
D3H	U	7.4	9.0	0.293	0.354

Sensor Cable Selection Chart

Sensor cable codes for length and type options				
Cable length m (ft)	Standard (PVC jacket)	Submersible (polyethylene jacket)	Plenum Rated (teflon jacket)	Armored
	-40...+80 °C (-40...+176 °F)	-40...+80 °C (-40...+176 °F)	-40...+200 °C (-40...+392 °F)	-40...+80 °C (-40...+176 °F)
Order code				
6 (20)	K01¹⁾	K11	K21	K31
15 (50)	K02	K12¹⁾	K22	K32¹⁾
30 (100)	K03¹⁾	K13¹⁾	K23	K33
46 (150)	K04¹⁾	K14	K24	K34
61 (200)	K05	K15	K25	K35
91 (300)	K06	K16	K26	K36

RTD Cable Selection Chart

RTD cable codes for length and type		
Cable length m (ft)	Standard (teflon wrapped)	Submersible (extruded jacket)
	-40 ... +200 °C (-40 ... +392 °F)	-40 ... +200 °C (-40 ... +392 °F)
Order code		
6 (20)	R01¹⁾	R11
15 (50)	R02¹⁾	R12
30 (100)	R03¹⁾	R13
46 (150)	R04	R14
61 (200)	R05	R15
91 (300)	R06	R16

¹⁾ Standard MLFB for quick delivery

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