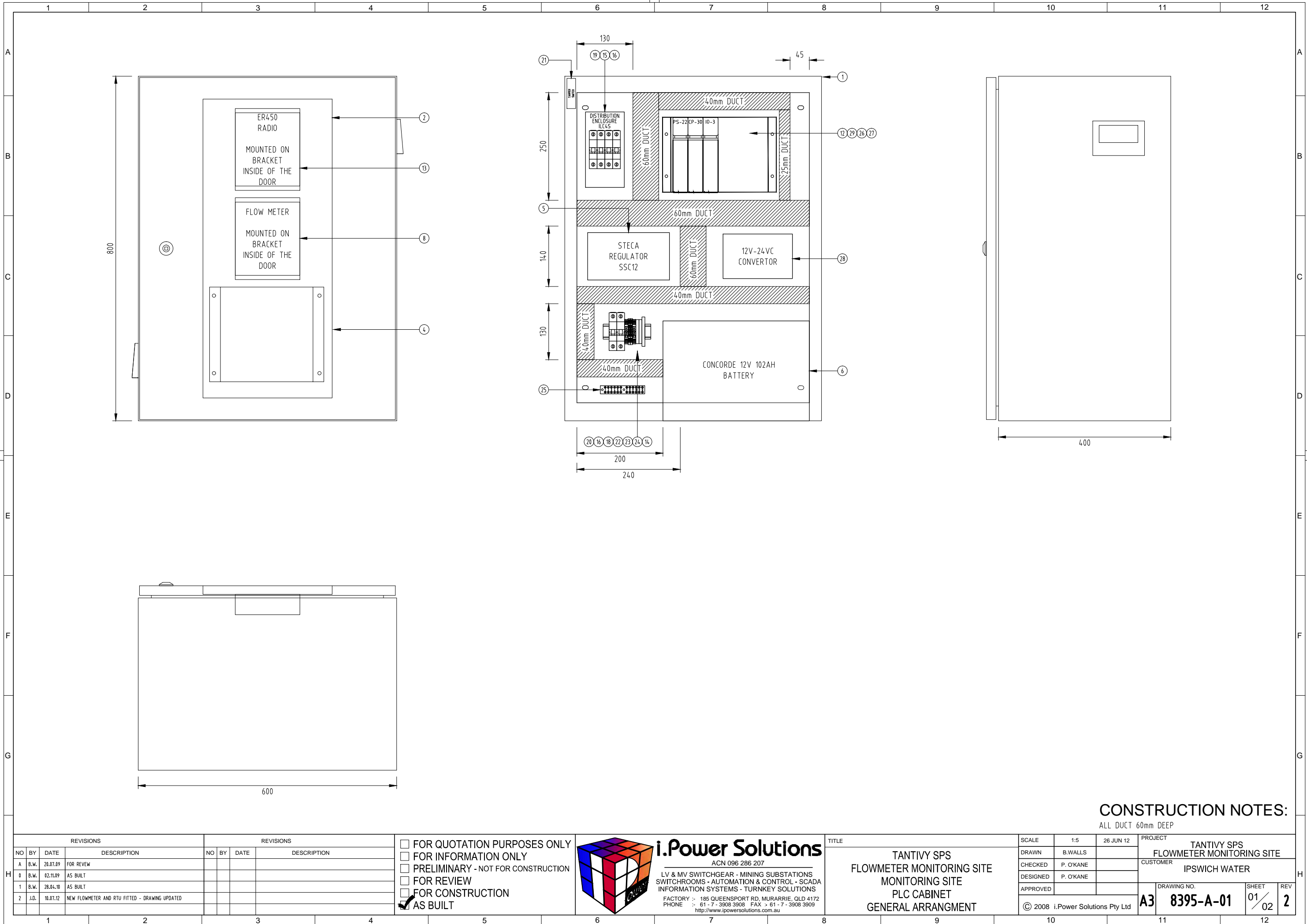



## Lend Lease

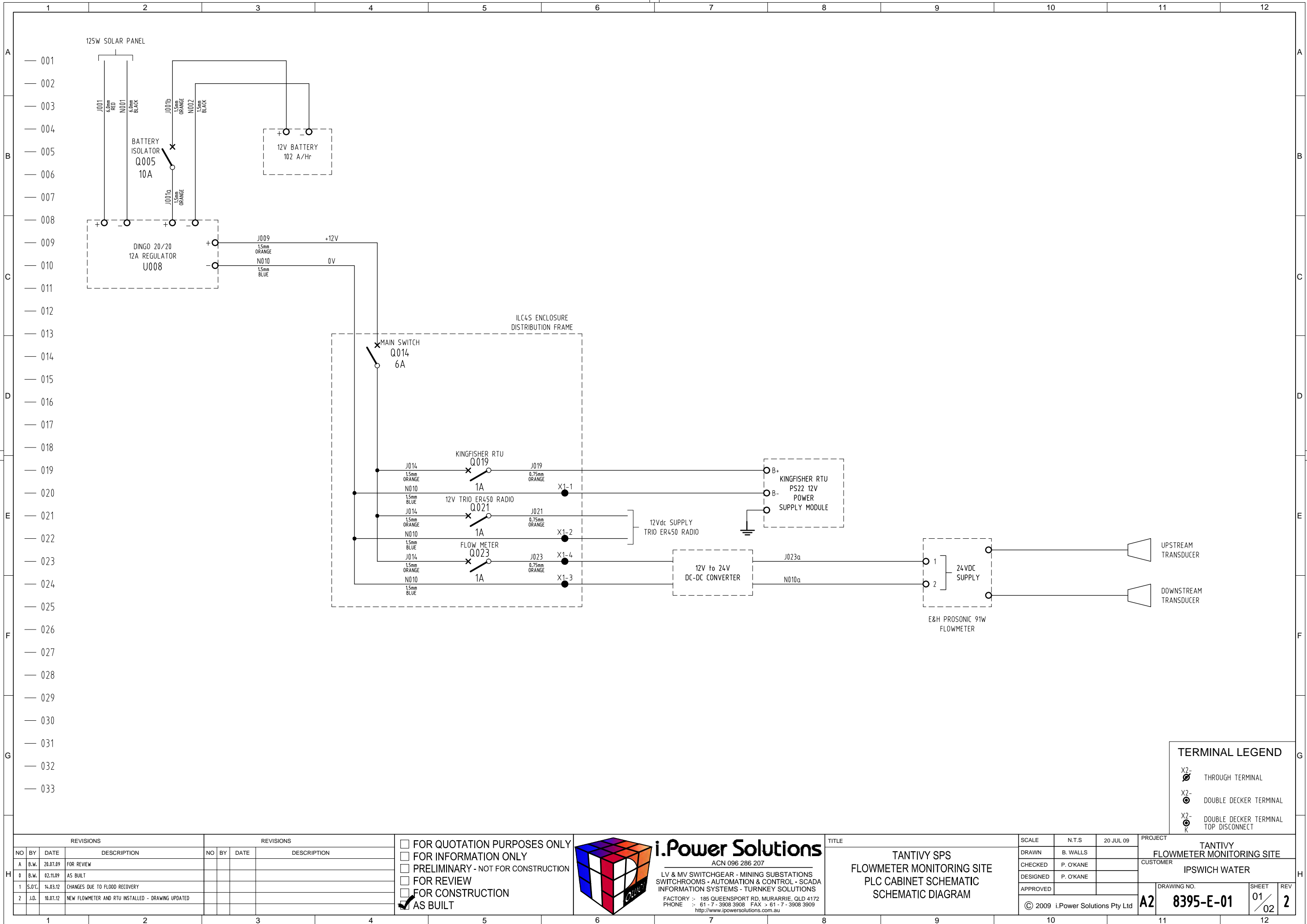
Electrical Schematic Drawings	1
Electrical DATA Sheets	2
Electrical Test Sheets	3
Flow Meter DATA	4
Flow Meter FAT	5
Control System FAT	6
Control System SAT	7
	8
	9
DATA CD	10

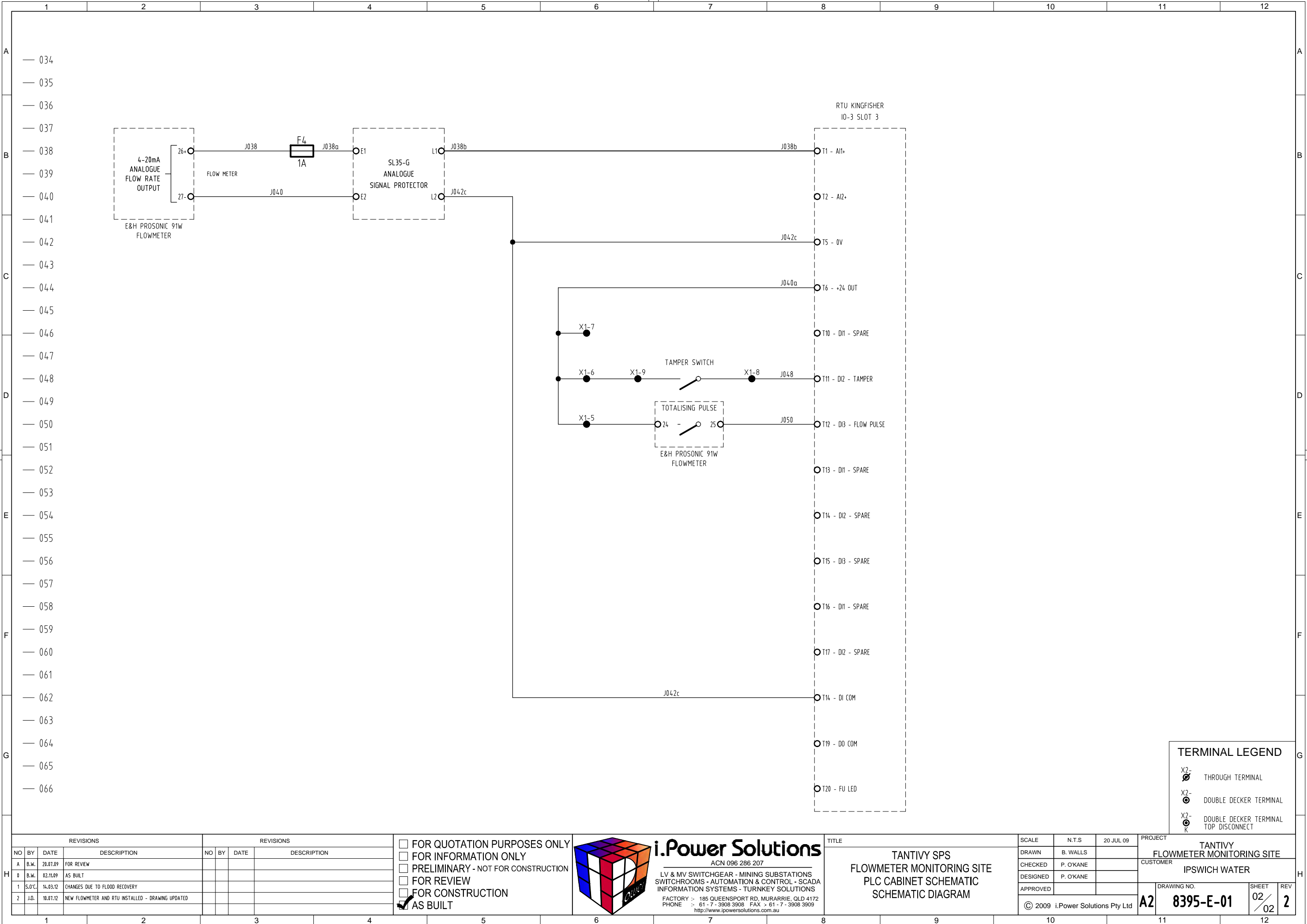


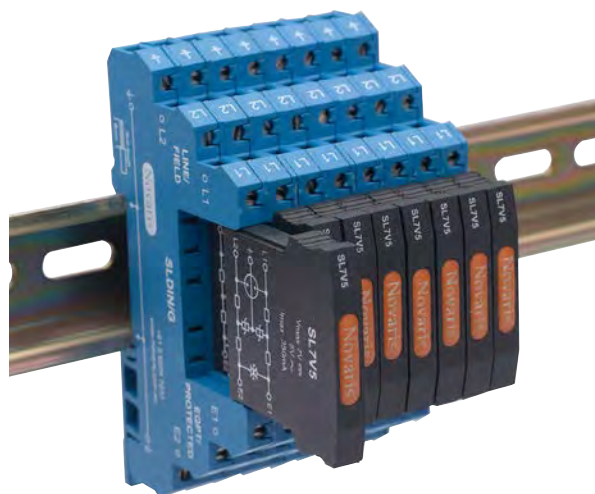
ITEM No.	QTY	DESCRIPTION	SUPPLIER	MANUFACTURER/CATALOGUE No.
1	1	STAINLESS ENCLOSURE 600W x 800H x 400D	B&R ENCLOSURES	IP29212/S
2	1	MOUNTING PAN FOR B&R ENCLOSURE	B&R ENCLOSURES	IPMP2921
3	1	T LOCKING HANDLE FOR B&R ENCLOSURE	B&R ENCLOSURES	IP040
4	1	PLASTIC PLAN A4 HOLDER	B&R ENCLOSURES	IPPLN
5	1	REGULATOR 15A 12/24 SOLAREX GAMMA	RF INDUSTRIES	PRS1515
6	1	BATTERY CONCORDE AGM 12V 102AH	RF INDUSTRIES	PVX890T
7	1	ANTENNA	RF INDUSTRIES	YB9-61
8	1	SURGE DIVERTER	RF INDUSTRIES	IS-B50LN-C2
9	1	SOLAR PANEL 125W 12VDC	RF INDUSTRIES	BP3125J
10	2	COAX PLUG (CNT400) CRIMP TYPE	RF INDUSTRIES	N-203
11	2	COAX PLUG (RG58) CRIMP TYPE	RF INDUSTRIES	N-98
12	1	KINGFISHER RTU BACKPLANE	SEMAPHORE	BA-6
13	1	ER450 CLASS 1 DIV 2	TRIO DATACOM	ER450-53A02-DH0
14	1	36V SIGNAL LINE PROTECTORS	POWERCOM SOLUTIONS	SL36-G
15	3	MCB 10kA 1P 1A C CURVE DIN DC RATED	NHP	DTCBDC101C
16	2	MCB 10kA 1P 6A C CURVE DIN DC RATED	NHP	DTCBDC106C
18	1	MCB 10kA 1P 10A C CURVE DIN DC RATED	NHP	DTCBDC110C
19	1	4 POLE ENCLOSURE	NHP	ILC4S
20	2	FUSE TERMINALS, 4mm	WEIDMULLER	9532440000
21	1	MAGNETIC TAMPER ALARM	DIRECT ALARM SUPPLIES	SENTROL 2505A
22	2	THROUGH TERMINALS	WEIDMULLER	WDU 2.5
23	1	END PLATE	WEIDMULLER	WAP 2.5/4/10
24	4	DIN TERMINAL CLAMP	WEIDMULLER	EW35
25	1	EARTH BAR 2 BOLT 6 HOLE	AUSLEC	CLI BPM9012
26	1	KINGFISHER PROCESSOR UNIT	SEMAPHORE	CP-30
27	1	KINGFISHER COMBINATION I/O UNIT	SEMAPHORE	I0-3
28	1	25W DC-DC CONVERTOR	POWERBOX	VTB24SC12
29	1	KINGFISHER POWER SUPPLY UNIT	SEMAPHORE	PS-22

REVISIONS				REVISIONS				<div><input type="checkbox"/> FOR QUOTATION PURPOSES ONLY <input type="checkbox"/> FOR INFORMATION ONLY <input type="checkbox"/> PRELIMINARY - NOT FOR CONSTRUCTION <input type="checkbox"/> FOR REVIEW <input type="checkbox"/> FOR CONSTRUCTION <input checked="" type="checkbox"/> AS BUILT</div>		<div><b>i.Power Solutions</b> ACN 096 286 207 LV &amp; MV SWITCHGEAR - MINING SUBSTATIONS SWITCHROOMS - AUTOMATION &amp; CONTROL - SCADA INFORMATION SYSTEMS - TURNKEY SOLUTIONS FACTORY :- 185 QUEENSPORT RD, MURARRIE, QLD 4172 PHONE :- 61 - 7 - 3908 3908 FAX :- 61 - 7 - 3908 3909 <a href="http://www.ipowersolutions.com.au">http://www.ipowersolutions.com.au</a></div>	TITLE  TANTIVY SPS FLOWMETER MONITORING SITE MONITORING SITE PLC CABINET GENERAL ARRANGMENT	SCALE	1:5	26 JUN 12	PROJECT TANTINY SPS FLOWMETER MONITORING SITE			
NO	BY	DATE	DESCRIPTION	NO	BY	DATE	DESCRIPTION					DRAWN	B.WALLS	CUSTOMER IPSWICH WATER				
A	B.W.	20.07.09	FOR REVIEW										CHECKED	P. O'KANE				
0	B.W.	02.11.09	AS BUILT										DESIGNED	P. O'KANE				
1	B.W.	28.04.10	AS BUILT										APPROVED			DRAWING NO.	SHEET	REV
2	J.D.	10.07.12	NEW FLOWMETER AND RTU FITTED - DRAWING UPDATED						© 2009 i.Power Solutions Pty Ltd			A3	8395-A-01	02/02	2			

DWG FILE: G:\WATER\JOB\SU2012\17022 - TANTIWY FLOW METER\8395 - ORIGINAL JOB FOR REF/B CONTROLLED DRAWINGS & DOCS\01\_SF-1003 CONSTRUCTION DRAWINGS AND REGISTER\8395-A-01.DWG







## SL Slimline Signal Line Protectors

Novaris SL range of plug-in signal line protectors provide surge protection for most twisted pair signalling schemes. Ideal for the protection of PLCs, fire and security systems, telecommunications and telemetry systems, railway signalling, SCADA and other industrial monitoring and control equipment.

### SL 485 - EC90

Product Series \_\_\_\_\_ Base option  
Top \_\_\_\_\_



#### Electrical Specifications

Connection type		Series		
Modes of protection		Transverse and common mode		
Maximum continuous voltage (DC)	$U_0$	8V	34V*	8V
Maximum continuous voltage (AC)	$U_c$	6V	24V*	6V
Discharge current 8/20 $\mu$ s	$I_{max}$	5kA		
Maximum load current	$I_L$	500mA		
Impulse voltage 1.2/50 $\mu$ s	$U_p$	15V	50V	15V
Line resistance		3.9 $\Omega$		
3dB Frequency @ 50 $\Omega$		20MHz		

#### Mechanical Specifications

Operating temperature / humidity	-20 to +40°C / 0 to 90% non-condensing
Terminal capacity	2.5mm <sup>2</sup>
Terminal screw torque	0.5Nm
Environmental	IP 20
Mounting	TS35 DIN rail
Weight	35g

#### Dimensions

Width	7mm
Height	102mm
Depth	68mm

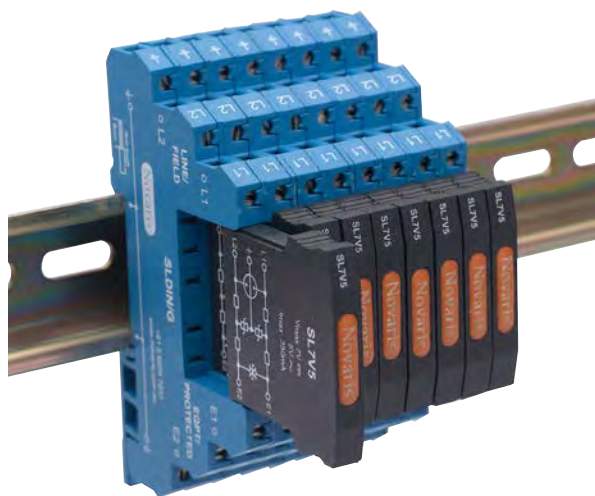
#### Base Options

Earth connected to DIN rail	-	G
Earth connected to DIN rail via GDT	Standard	EC90

\* Voltage variations available by request

#### Standards Compliance

ITU-T K.44  
AS/NZS 1768  
IEEE C62.41  
BS 6651  
CP 33  
IEC 61643-21  
UL497B



## SL Slimline Signal Line Protectors

Novaris SL range of plug-in signal line protectors provide surge protection for most twisted pair signalling schemes. Ideal for the protection of PLCs, fire and security systems, telecommunications and telemetry systems, railway signalling, SCADA and other industrial monitoring and control equipment.

SL 7v5 - G

Product Series  
Top

Base option



### Electrical Specifications

Connection type		Series					
Modes of protection		Transverse and common mode					
Maximum continuous voltage (DC)	$U_0$	7V	16V	34V	65V	200V	200V
Maximum continuous voltage (AC)	$U_c$	5V	11V	24V	46V	140V	140V
Discharge current 8/20 $\mu$ s	$I_{max}$	5kA					
Maximum load current	$I_L$	350mA					180mA
Impulse voltage 1.2/50 $\mu$ s	$U_p$	8V	19V	40V	76V	235V	30V
Line resistance		8.2 $\Omega$					17 $\Omega$
3dB Frequency @ 50 $\Omega$		250kHz				10MHz	20MHz

### Mechanical Specifications

Operating temperature / humidity	-20 to +40°C / 0 to 90% non-condensing
Terminal capacity	2.5mm <sup>2</sup>
Terminal screw torque	0.5Nm
Environmental	IP 20
Mounting	TS35 DIN rail
Weight	35g

### Dimensions

Width	7mm
Height	102mm
Depth	68mm

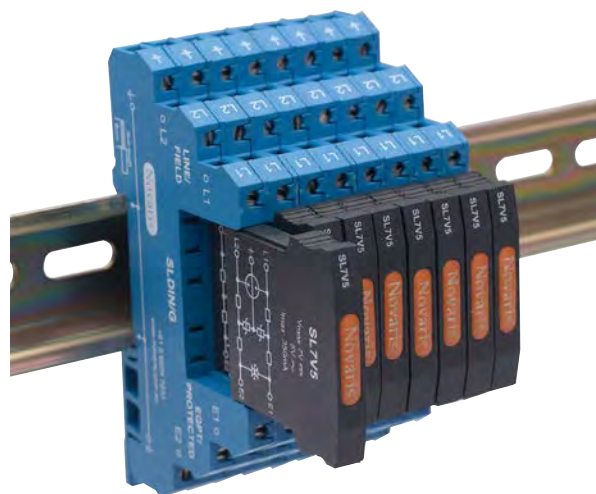
### Base Options

Earth connected to DIN rail	G
Earth connected to DIN rail via GDT	EC90

### Standards Compliance

ITU-T K.44
AS/NZS 1768
IEEE C62.41
BS 6651
CP 33
IEC 61643-21
UL497B
A-tick (PSTN & iSwitch)





## SL Slimline Signal Line Protectors

Novaris SL range of plug-in signal line protectors provide surge protection for most twisted pair signalling schemes. Ideal for the protection of PLCs, fire and security systems, telecommunications and telemetry systems, railway signalling, SCADA and other industrial monitoring and control equipment.

### SL 485 - EC90

Product Series

Base option

Top



#### Electrical Specifications

Connection type		Series		
Modes of protection		Transverse and common mode		
Maximum continuous voltage (DC)	$U_0$	8V	34V*	8V
Maximum continuous voltage (AC)	$U_c$	6V	24V*	6V
Discharge current 8/20 $\mu$ s	$I_{max}$	5kA		
Maximum load current	$I_L$	500mA		
Impulse voltage 1.2/50 $\mu$ s	$U_p$	15V	50V	15V
Line resistance		3.9 $\Omega$		
3dB Frequency @ 50 $\Omega$		20MHz		

#### Mechanical Specifications

Operating temperature / humidity	-20 to +40°C / 0 to 90% non-condensing
Terminal capacity	2.5mm <sup>2</sup>
Terminal screw torque	0.5Nm
Environmental	IP 20
Mounting	TS35 DIN rail
Weight	35g

#### Dimensions

Width	7mm
Height	102mm
Depth	68mm

#### Base Options

Earth connected to DIN rail	-	G
Earth connected to DIN rail via GDT	Standard	EC90

\* Voltage variations available by request

#### Standards Compliance

ITU-T K.44  
AS/NZS 1768  
IEEE C62.41  
BS 6651  
CP 33  
IEC 61643-21  
UL497B



# Commissioning Record



Thursday, 21 June 2012  
11:43:16

## IDENTITY

Unit Name	SFM351		
Location	Tantivy St Flowmeter		
Unit Serial No.	72689		
SID Code	2	E Series	

## System Status

Diagnostics	Enabled
Base Station	NO
Firmware Pack(s)	
Radio	R4.2.3

## Last Poll Results

TEMP	47°C (117°F)		
Rx Sig	-78 dBm	Fwr PWR	30 dBm
FREQ Err	-862 Hz	Rev PWR	8 dBm
DC Volts	13.8 V	Ret. Loss	21.4 dB
	VSWR	1.2:1	
21/06/2012 11:39:31			

## Packet Error Test Results

Tx Packets:	305
Rx Packets:	257
Lost Packets:	48
Error %:	15.7
Normalised BER:	6.30E-04
21/06/2012 11:43:11	

## Comment

# Sun Xtender PVX-890T

## Solar Battery Manufactured by: Concorde Battery Corporation



[Enlarge Solar Battery](#)

### Description of Solar Battery:

VRLA-AGM Deep Cycle Battery for Off Grid and Grid Tied Systems.

Recombinant gas Sun Xtender® Series solar batteries are low resistance, valve regulated lead acid (VRLA) batteries.

- Designed for photovoltaic applications for superior & reliable solar power
- "T" terminals are copper alloy with silicon bronze bolts, nuts, & washers
- Low impedance design
- Maintenance free
- Constructed with non removable vent valves - no addition of electrolyte or water required
- Non spillable in any attitude
- Shipped fully charged and ready to install
- Manufactured with absorbed glass mat separators (AGM)
- Sun Xtender® Series batteries ship non-HAZMAT

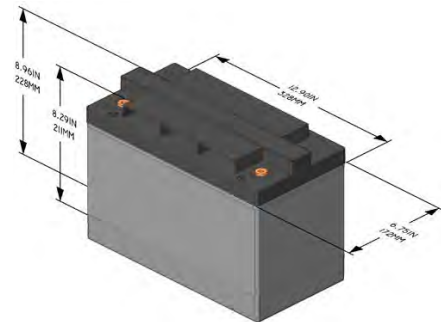
PVX-890T applications include Street & Bus Stop Lighting, Cathodic Protection.

[Battery Outline Drawings \(PDF\)](#)

[Click For Battery Spec Page](#)

### Renewable Energy Battery Applications

[Area Lighting: Street, Parking Lot, Transit Shelter Solar Security Lighting Cathodic Protection Systems](#)



### PVX-890T

Voltage		12v					
Battery Series		<a href="#">12 Volt Sun Xtender Series</a>					
Nominal Capacity Ampere Hours @ 25° C (77° F) to 1.75 Volts per cell - 24 Hour Rate		89 Ah					
Weight		62 lb / 28.2 kg					
Sun Xtender® Solar Battery Part Number	Length		Width		Height		
	in	mm	in	mm	in	mm	
PVX-890T	12.90	328	6.75	172	8.96	228	
Nominal Capacity Ampere Hours @ 25° C (77° F) to 1.75 volts per cell							
1 Hr Rate	2 Hr Rate	4 Hr Rate	8 Hr Rate	24 Hr Rate	48 Hr Rate	72 Hr Rate	120 Hr Rate
55 Ah	70 Ah	72 Ah	79 Ah	89 Ah	95 Ah	98 Ah	102 Ah

Specifications subject to change without notice.

# PBIH Series

15-150 WATTS DC/DC SINGLE OUTPUT

## FEATURES

- Wide selection of models
- 4 input voltage ranges
- High efficiency
- Low output ripple
- Proven reliability
- Good thermal margins

## SPECIFICATIONS

INPUT	
Input voltage	12VDC (9.2–16) 24VDC (19–32) 48VDC (38–63) 110VDC (85–140)
Inrush current	20A max. for 110V only
OUTPUT	
Output voltage	See table
Voltage adjustment	±10%, ±5% for PBIH-F
Output current	See table
Ripple & noise	Output Volts x 1% + 50mV to -100mV pk-pk
Line regulation	0.8% over input range
Load regulation	0.9%, 0%–100% load
Temperature coefficient	0°C to 50°C, 0.03% per °C
Overvoltage protection	O.V. clamp, PBIH-F Output shutdown, PBIH-G, J, M, R – input must be switched off for at least 30S to reactivate
Overcurrent protection	Fold back – PBIH-F Current limiting, PBIH-G, J, M, R (PBIH-R series is adjustable); PBIH110xxR models are not adjustable
Drift	Output V x 0.5% + 15(mV) per 8 hrs after 1 hr warm-up
Rise Time	200ms max. – PBIH-F, M, R 100ms max. – PBIH-G, J (at 25°C)
Holdup time	10ms (only 110V input)
Remote sense	PBIH-R Series only



OPERATING	
Efficiency	70%–89%
Safety isolation (1 minute)	Type – 12, 24, 48V input Input – Output: 1500VAC Input– Case: 1500VAC Output– Case: 500VAC Type– 110V input Input– Output: 2000VAC Input– Case: 2000VAC Output– Case: 500VAC
Insulation resistance	50MΩ (500VDC) Input – Case
Parallel operation	Consult sales office for details
Remote control	PBIH-R Series: Open link: output normal Short link: output off
ENVIRONMENTAL	
Operating temperature	0°C to 50°C full load
Cooling	Convection cooled
Storage temperature	-20°C to +85°C
Humidity	85%
Shock	30G, PBIH-F, G and J
Vibration	(5Hz–10Hz, 10mm), (10Hz–50Hz) 2G, PBIH-F, G and J
STANDARDS AND APPROVALS	
Safety	Designed to UL1950
C-Tick	AS/NZS CISPR11 Group 1, Class A
MECHANICAL	
Weight	PBIH-F : 250g PBIH-G : 380g PBIH-J : 410g PBIH-M : 800g PBIH-R : 1.4kg

PBIH Series

15-150 WATTS DC/DC SINGLE OUTPUT

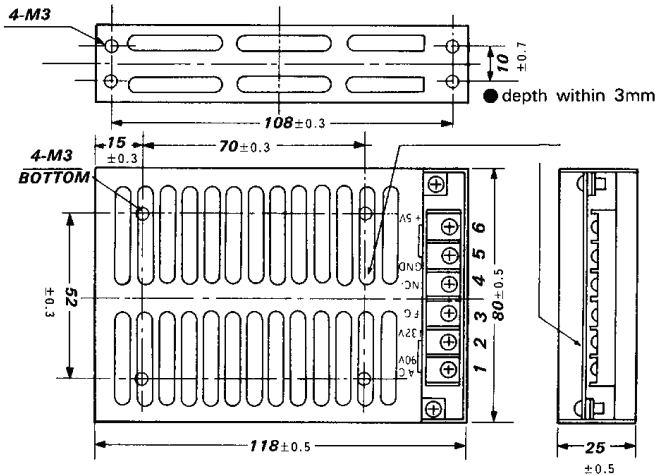
SELECTION TABLE

MODEL NUMBER	INPUT	OUTPUT	OUTPUT POWER
PBIH-1205F	9.2-16V	5V 3A	15W
PBIH-1212F	9.2-16V	12V 1.2A	15W
PBIH-1215F	9.2-16V	15V 1A	15W
PBIH-1224F	9.2-16V	24V 0.62A	15W
PBIH-2405F	19-32V	5V 3A	15W
PBIH-2412F	19-32V	12V 1.2A	15W
PBIH-2415F	19-32V	15V 1A	15W
PBIH-2424F	19-32V	24V 0.62A	15W
PBIH-4805F	38-63V	5V 3A	15W
PBIH-4812F	38-63V	12V 1.2A	15W
PBIH-4815F	38-63V	15V 1A	15W
PBIH-4824F	38-63V	24V 0.62A	15W
PBIH-11005F	85-140V	5V 3A	15W
PBIH-11012F	85-140V	12V 1.2A	15W
PBIH-11015F	85-140V	15V 1A	15W
PBIH-11024F	85-140V	24V 0.62A	15W
PBIH-1205G	9.2-16V	5V 5A	25W
PBIH-1212G	9.2-16V	12V 2.1A	25W
PBIH-1215G	9.2-16V	15V 1.7A	25W
PBIH-1224G	9.2-16V	24V 1.1A	25W
PBIH-1248G	9.2-16V	48V 0.5A	25W
PBIH-2405G	19-32V	5V 5A	25W
PBIH-2412G	19-32V	12V 2.1A	25W
PBIH-2415G	19-32V	15V 1.7A	25W
PBIH-2424G	19-32V	24V 1.1A	25W
PBIH-2448G	19-32V	48V 0.5A	25W
PBIH-4805G	38-63V	5V 5A	25W
PBIH-4812G	38-63V	12V 2.1A	25W
PBIH-4815G	38-63V	15V 1.7A	25W
PBIH-4824G	38-63V	24V 1.1A	25W
PBIH-4848G	38-63V	48V 0.5A	25W
PBIH-11005G	85-140V	5V 5A	25W

MODEL NUMBER	INPUT	OUTPUT	OUTPUT POWER
PBIH-11012G	85-140V	12V 2.1A	25W
PBIH-11015G	85-140V	15V 1.7A	25W
PBIH-11024G	85-140V	24V 1.1A	25W
PBIH-11048G	85-140V	48V 0.5A	25W
PBIH-1205J	9.2-16V	5V 8A	40W
PBIH-1212J	9.2-16V	12V 3.3A	40W
PBIH-1215J	9.2-16V	15V 2.7A	40W
PBIH-1224J	9.2-16V	24V 1.7A	40W
PBIH-1248J	9.2-16V	48V 0.8A	40W
PBIH-2405J	19-32V	5V 10A	50W
PBIH-2412J	19-32V	12V 4.3A	50W
PBIH-2415J	19-32V	15V 3.4A	50W
PBIH-2424J	19-32V	24V 2.5A	50W
PBIH-2448J	19-32V	48V 1A	50W
PBIH-4805J	38-63V	5V 10A	50W
PBIH-4812J	38-63V	12V 4.3A	50W
PBIH-4815J	38-63V	15V 3.4A	50W
PBIH-4824J	38-63V	24V 2.5A	50W
PBIH-4848J	38-63V	48V 1A	50W
PBIH-11005J	85-140V	5V 10A	50W
PBIH-11012J	85-140V	12V 4.3A	50W
PBIH-11015J	85-140V	15V 3.4A	50W
PBIH-11024J	85-140V	24V 2.5A	50W
PBIH-11048J	85-140V	48V 1A	50W
PBIH-1205M	9.2-16V	5V 18A	100W
PBIH-1212M	9.2-16V	12V 9A	100W
PBIH-1215M	9.2-16V	15V 7A	100W
PBIH-1224M	9.2-16V	24V 4.5A	100W
PBIH-1248M	9.2-16V	48V 2A	100W
PBIH-2405M	19-32V	5V 20A	100W
PBIH-2412M	19-32V	12V 9A	100W
PBIH-2415M	19-32V	15V 7A	100W

MODEL NUMBER	INPUT	OUTPUT	OUTPUT POWER
PBIH-2424M	19-32V	24V 5A	100W
PBIH-2448M	19-32V	48V 2A	100W
PBIH-4805M	38-63V	5V 20A	100W
PBIH-4812M	38-63V	12V 9A	100W
PBIH-4815M	38-63V	15V 7A	100W
PBIH-4824M	38-63V	24V 5A	100W
PBIH-4848M	38-63V	48V 2A	100W
PBIH-11005M	85-140V	5V 20A	100W
PBIH-11012M	85-140V	12V 9A	100W
PBIH-11015M	85-140V	15V 7A	100W
PBIH-11024M	85-140V	24V 5A	100W
PBIH-11048M	85-140V	48V 2A	100W
PBIH-1205R	9.2-16V	5V 27A	150W
PBIH-1212R	9.2-16V	12V 13A	150W
PBIH-1215R	9.2-16V	15V 10A	150W
PBIH-1224R	9.2-16V	24V 6.5A	150W
PBIH-1248R	9.2-16V	48V 3.3A	150W
PBIH-2405R	19-32V	5V 30A	150W
PBIH-2412R	19-32V	12V 14A	150W
PBIH-2415R	19-32V	15V 11A	150W
PBIH-2424R	19-32V	24V 7A	150W
PBIH-2448R	19-32V	48V 3.5A	150W
PBIH-4805R	38-63V	5V 30A	150W
PBIH-4812R	38-63V	12V 14A	150W
PBIH-4815R	38-63V	15V 11A	150W
PBIH-4824R	38-63V	24V 7A	150W
PBIH-4848R	38-63V	48V 3.5A	150W
PBIH-11005R	85-140V	5V 30A	150W
PBIH-11012R	85-140V	12V 14A	150W
PBIH-11015R	85-140V	15V 11A	150W
PBIH-11024R	85-140V	24V 7A	150W
PBIH-11048R	85-140V	48V 3.5A	150W

PBIH-F



• Dimensions in mm

terminal No.	
1	0 V (DC in)
2	+V (DC in)
3	FG
4	NO Connection
5	-V out
6	+V out



15-150 WATTS SINGLE OUTPUT

Technical drawing of the 4-M3 connector showing dimensions in mm.

**Top View Dimensions:**

- Overall width:  $70 \pm 0.5$
- Overall height:  $56 \pm 0.3$
- Pin pitch (center-to-center):  $7.1 \pm 0.1$
- Pin diameter:  $1.0 \pm 0.1$
- Pin depth (within 3mm):  $\phi$  depth within 3mm
- Terminal positions: 0, 1, 2, 3, 4, 5, 6, 7

**Side View Dimensions:**

- Overall width:  $95 \pm 0.5$
- Overall height:  $32.5 \pm 0.5$
- Pin pitch (center-to-center):  $7.1 \pm 0.1$
- Pin diameter:  $1.0 \pm 0.1$
- Pin depth (within 5mm):  $\phi$  depth within 5mm
- Terminal positions: 0, 1, 2, 3, 4, 5, 6, 7

**Detail View Dimensions:**

- Overall width:  $31 \pm 0.5$
- Overall height:  $14.1 \pm 0.3$
- Pin pitch (center-to-center):  $7.1 \pm 0.1$
- Pin diameter:  $1.0 \pm 0.1$
- Pin depth (within 3mm):  $\phi$  depth within 3mm
- Terminal positions: 0, 1, 2, 3, 4, 5, 6, 7

**Terminal Identification:**

- Terminal No. 0 to 7
- 4-M3

Terminal	Connection
0	FG
1	DC +V in
2	0V in
3	LFG
4	NO
5	NO
6	-V out
7	+V out

Dimension in mm

10

9.6

3.3 ± 0.1

terminal No.

1 2 3 4 5 6 7

4-M3  
BOTTOM

100 ± 0.5

6.1 ± 0.2

30 ± 0.6

118 ± 0.5

10 ± 0.2

160 ± 0.5

4-M3

\* depth within 3mm

Terminal	Connection
1	FG
2	DC +V in
3	0V in
4	LFG
5	-V out
6	+V out
7	NC

Technical drawings of the V403 terminal block showing dimensions in mm.

**Top View (Main):**

- Overall width:  $190 \pm 1$  mm
- Overall height:  $97 \pm 1$  mm
- Terminal width: 48 mm
- Mounting holes: 4-M3, depth within 8 mm
- Overall length:  $140 \pm 0.5$  mm
- Mounting hole spacing:  $20 \pm 0.5$  mm

**Side View (Left):**

- Terminal No. 1 through 7 are indicated.
- Terminal pitch: 1.27 mm
- Terminal width: 48 mm
- Terminal height:  $97 \pm 1$  mm

Terminal	Connection
1	+V out
2	+V out
3	-V out
4	-V out
5	FG
6	-V in
7	+V in

Terminal	Connection
1, 2	+V out
3	+S
4	-S
5, 6	-V out
7	Remote Control
8	DC +V in
9	DC 0V in
10	FG

# VALVE-REGULATED LEAD ACID BATTERIES: INDIVIDUAL DATA SHEET

## LC-R127R2P

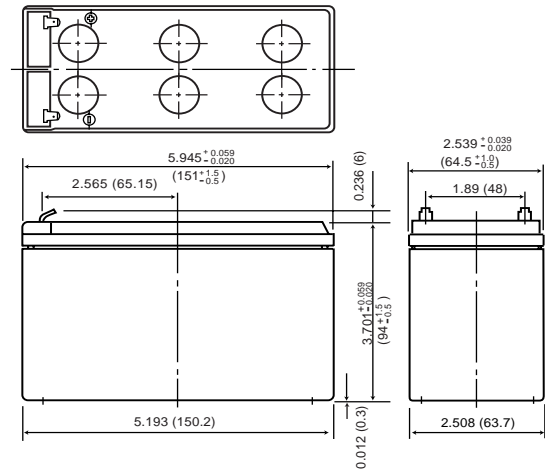


For main and standby power supplies.

Expected trickle life: 3-5 years at 25°C, Approx. 5 years at 20°C.

### Dimensions (mm)

Terminal type: Faston 187 or Faston 250



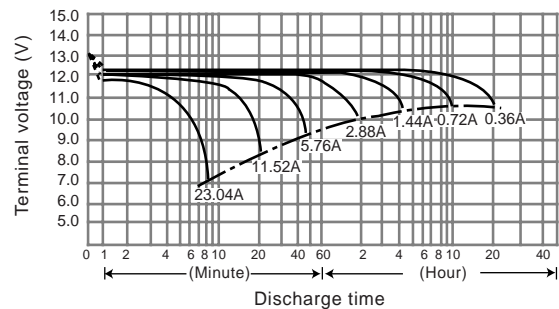
Battery case resin: Standard (UL94HB) Color is black.

### Specifications

Nominal Voltage		12V
Rated Capacity (20 hour rate)		7.2Ah
Dimensions	Length	5.945 inches (151.0 mm)
	Width	2.539 inches (64.5 mm)
	Height	3.702 inches (94.0 mm)
	Total Height*	3.937 inches (100.0 mm)
Approx. mass		5.45 lbs. (2.47 kg)
Standard Terminals and Resin	UL94HB Faston 187	LC-R127R2P
	UL94HB Faston 250	LC-R127R2P1

\* The total height with #250 terminal is 101.5mm.

### Discharge characteristics 77°F (25°C) (Note)

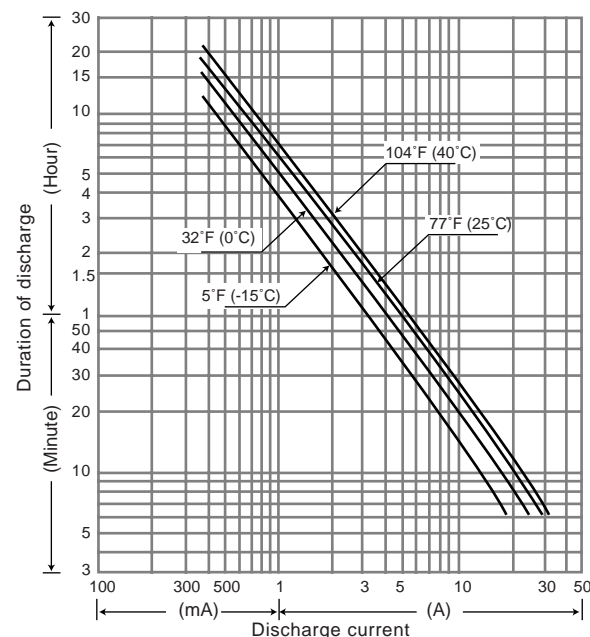


### Characteristics

Capacity (note) 77°F (25°C)		20 hour rate (360mA)	7.2Ah
		10 hour rate (680mA)	6.8Ah
		5 hour rate (1260mA)	6.3Ah
		1 hour rate (4900mA)	4.9Ah
		1.5 hour rate discharge Cut-off voltage 10.5 V	3.5A
Internal Resistance		Fully charged battery 77°F (25°C)	Approx. 40mΩ
Temperature dependency of capacity (20 hour rate)		104°F (40°C)	102%
		77°F (25°C)	100%
		32°F (0°C)	85%
		5°F (-15°C)	65%
Self discharge 77°F (25°C)		Residual capacity after standing 3 months	91%
		Residual capacity after standing 6 months	82%
		Residual capacity after standing 12 months	64%
Charge Method (Constant Voltage)	Cycle use (Repeating use)	Initial current	2.88 A or smaller
		Control voltage	14.5V to 14.9V (per 12V cell 25°C)
	Trickle use	Initial current	1.08 A or smaller
		Control voltage	13.6V to 13.8V (per 12V cell 25°C)

(Note) The above characteristics data are average values obtained within three charge/discharge. Cycles not the minimum values.

### Duration of discharge vs. Discharge current (Note)



## Miniature circuit breakers and accessories (MCBs)

1

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## Safe-T series

### 6-100 A

#### 6 kA

- Standard AS 3111 AS 2184 <sup>4)</sup>
- Approval No. V99347
- UL 489 fluorescent switching duty <sup>4)</sup>
- Lloyd's register
- Current range 6-100 A 1, 2, 3 and 4 pole
- Clip-tray mounting. Suits CT type busbar chassis
- General purpose light and power distribution

#### Technical data



























**Interrupting capacity:** 6 kA at 250 V AC (sym) 1 pole  
 6 kA at 400 V AC (sym) 2 & 3 pole  
 5 kA at 125 V DC 2 pole

**Thermal setting:** Fixed (40 °C)

**Magnetic setting:** Fixed

**Tropic proofed:** Standard



Amp rating	Cat. No. <sup>1)</sup>	1 pole Price \$	2 pole Price \$	3 pole Price \$	3P + N <sup>2)</sup> Price \$
6	SAFE-T6_06	59.50	 183.00	215.00	 305.00
10	SAFE-T6_10	59.50	 183.00	215.00	 305.00
16	SAFE-T6_16	59.50	 183.00	215.00	 305.00
20	SAFE-T6_20	59.50	 183.00	215.00	 305.00
25	SAFE-T6_25	59.50	 183.00	215.00	 305.00
32	SAFE-T6_32	59.50	 183.00	215.00	 305.00
40	SAFE-T6_40	59.50	 183.00	215.00	 305.00
50	SAFE-T6_50	59.50	 183.00	215.00	 305.00
63	SAFE-T6_63	59.50	 183.00	215.00	 305.00
80	SAFE-T6_80	133.00	 340.00	390.00	 475.00
100	SAFE-T6_100	133.00	 340.00	390.00	 475.00
63	SAFE-T6_63NA <sup>3)</sup>	63.00	 158.00	195.00	 275.00
100	SAFE-T6_100NA <sup>3)</sup>	99.00	 210.00	275.00	 425.00

**Notes:** <sup>1)</sup> Insert No. of poles into Cat. No. space marked ' \_ ' e.g. SAFE-T6 3 25 = 3P.


<sup>2)</sup> Neutral pole is switched but does not provide overcurrent or short circuit protection.

<sup>3)</sup> NA – Non-Auto MCB without overcurrent or short circuit protection, suitable for main switch.

<sup>4)</sup> Fluorescent light switching duty – UL 489

All Safe-T MCBs are by design suitable for fluorescent light switching duty as per the requirements of UL 489 issued by Underwriters Laboratories (USA). Performance standards to regularly switch banks of fluorescent lights ON and OFF require the MCB to withstand the higher inrush current (up to 30 times normal rating). If the MCB cannot withstand this inrush current, contact erosion and excess temperature rise will be experienced. Safe-T MCBs have been designed to withstand this type of duty. (Refer NHP)

Refer page 9 - 10 for back-up fuse data. Accessories refer page 1 - 4.

 Available on indent only.

## Safe-T series

### 6-100 A fitted with shunt trip

1

#### 6 kA

- Standard AS 3111 AS 2184
- Approval No. V99347
- Lloyd's register
- Current range 6-100 A 1, 2, 3 and 4 pole
- Clip-tray mounting
- Suits CT type busbar chassis
- General purpose light and power distribution



#### Operation

For remote tripping of Safe-T MCB (1 to 4 poles), manual resetting of MCB required. Inline shunt trip requires no extra pole spaces.

#### Application

Emergency stop and isolation of industrial socket outlets.

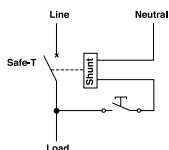
#### Coil rating

Voltage (V)	Current peak (A)
120-440 V AC	4.88 (440 V)
48-250 V DC	2.32 (250 V)






































#### Warnings

Short time rated coil.

Coil burnout will result if coil remains energised.



Shunt trip wiring diagram

Amp rating	Cat. No. <sup>1)</sup>	1 pole Price \$	2 pole Price \$	3 pole Price \$	3P + N <sup>2)</sup> Price \$
6	SAFE-T6_06SHT	 183.00	 315.00	 335.00	 425.00
10	SAFE-T6_10SHT	 183.00	 315.00	335.00	 425.00
16	SAFE-T6_16SHT	 183.00	 315.00	335.00	 425.00
20	SAFE-T6_20SHT	183.00	 315.00	335.00	 425.00
25	SAFE-T6_25SHT	183.00	 315.00	335.00	 425.00
32	SAFE-T6_32SHT	183.00	 315.00	335.00	 425.00
40	SAFE-T6_40SHT	 183.00	 315.00	335.00	 425.00
50	SAFE-T6_50SHT	 183.00	 315.00	335.00	 425.00
63	SAFE-T6_63SHT	 183.00	 315.00	335.00	 425.00
80	SAFE-T6_80SHT	 260.00	 460.00	520.00	 610.00
100	SAFE-T6_100SHT	 260.00	 460.00	520.00	 610.00
63	SAFE-T6_63NASHT <sup>3)</sup>	 177.00	 275.00	325.00	 410.00
100	SAFE-T6_100NASHT <sup>3)</sup>	 215.00	 335.00	410.00	 540.00


**Notes:** <sup>1)</sup> Insert No. of poles into Cat. No. space marked ' \_ ' e.g. SAFE-T6 3 25SHT = 3P.

<sup>2)</sup> Neutral pole is switched but does not provide overcurrent or short circuit protection.

<sup>3)</sup> NA - Non-Auto MCB without overcurrent or short circuit protection, suitable for main switch.

Refer page 9 - 10 for backup fuse data.








Accessories to suit Safe-T MCBs refer page 1 - 4.

 Available on indent only.

1

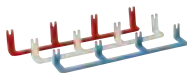
## Safe-T series

### Options, hardware and accessories

Description		Cat. No.	Price \$
Handle lock	Yellow	TAA-5LY <sup>1)</sup>	3.20
Handle cap	Green	 TAA-5CG <sup>1)</sup>	2.20
	Yellow	 TAA-5CY <sup>1)</sup>	2.20
Padlock attachment	1 pole	TKB-50SG-L <sup>1)</sup>	20.50
	3 pole	TKC-50SG <sup>1)</sup>	20.50
Padlock attachment kits (captive)	12 pack and resin	SAFE-TLCK 12 <sup>1)</sup>	153.00
	24 pack and resin	SAFE-TLCK 24 <sup>1)</sup>	200.00
Tunnel terminal	35 mm <sup>2</sup> Safe-T (6-63 A)	7T-1ST	12.50
	70 mm <sup>2</sup> Safe-T (80-100 A)	7T-2ST	15.00
T-off plastic caps		TH250TOPC	0.60
Pole fillers		SAFE-TPF	1.70
Clip-tray (per 12 pole pieces)		TDB-50SG-12	19.50
Link bar (1 phase)	6 pole	 LB-6	12.50
	9 pole	 LB-9	14.50
	12 pole	 LB-12	18.00
	15 pole	 LB-15	23.50
	18 pole	LB-18	26.00
	24 pole	 LB-24	30.50
Link bar (3 phase)	12 pole	LB3PH12	147.00
120 A	18 pole	LB3PH18	205.00
Wiring harness (3 phase)		SAFE-TWH3P	4.50



3 phase  
wiring harness



3 phase link bars



1 phase link bar




Tunnel terminals



TAA 5LY & TKC50SG  
Locking attachments

**Notes:** <sup>1)</sup> Doesn't suit SRCB.

 Available on indent only.

## Safe-T series (RCBO)

### Single pole width residual current circuit breakers

1

- Standard AS 3111 AS 3190
- Approval No. N15251
- Mines Approval – MDA Ex. 11576  
– QMD 997458XU <sup>2)</sup>
- Current rating: 10, 16 and 20 A
- Voltage 240 V AC 50/60 Hz (not suitable for 415/440 V)
- Short circuit protection 6000 A
- Earth leakage protection 30 mA and 10 mA



#### Operation

Safe-T single pole width residual current circuit breakers offer overload, short circuit and earth leakage protection in a single module width unit.

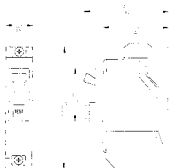
Mounting arrangements are identical to those throughout the Safe-T MCB range utilising the NHP clip-tray mounting system in panelboards and loadcentres.

Amp rating	No. of poles	Modules	Trip sensitivity (mA)	Cat. No. <sup>1)</sup>	Price \$
10	1	1	30	<b>SRCB 1030</b>	<b>315.00</b>
16	1	1	30	<b>SRCB 1630</b>	<b>315.00</b>
20	1	1	30	<b>SRCB 2030</b>	<b>315.00</b>
10	1	1	10	<b>SRCB 1010</b>	<b>345.00</b>
16	1	1	10	<b>SRCB 1610</b>	<b>345.00</b>
20	1	1	10	<b>SRCB 2010</b>	<b>345.00</b>

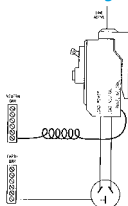
#### Accessories

Description		Cat. No.	Price \$
Padlock attachment kit (captive)	12 pack and resin	<b>SRCBLCK 12</b>	<b>265.00</b>
	24 pack and resin	<b>SRCBLCK 24</b>	<b>435.00</b>
Adaptor kit	Eaton, Cutler-Hammer (Quicklag)	<b>SRCBWA</b>	<b>25.50</b>
	Heinemann	<b>SRCBHA</b>	<b>25.50</b>

#### Dimensions (mm)



#### Connection diagram



Adaptors - allows SRCB to be fitted to Heinemann and Eaton chassis



Padlock attachment kit

**Notes:** <sup>1)</sup> Neutral not switched.

<sup>2)</sup> 30 mA units only.

**Nuisance tripping may be experienced in VFD and motor starting applications refer NHP.**

**i** Available on indent only.

## Safe - T series (ELR)

### Earth leakage relay

- Standard AS 3190
- Approval No. N15380
- Mines Approval <sup>1)</sup> – MDA Ex. 11577  
– QMD 997459XU
- NHP clip-tray mounting (CT chassis)

#### Application

The ELR is identical in width to the single pole Safe-T MCB. The ELR is clip-tray mountable alongside the Safe-T MCB when fitted to the CT chassis, as found in the CST/CPS series panelboards.

When the ELR is combined with a Safe-T MCB fitted with a shunt trip, the resulting combination offers overload, short circuit and earth leakage protection and can be retrofitted into an existing installation or installed in a new installation.

**Suitable for commercial and industrial applications.**

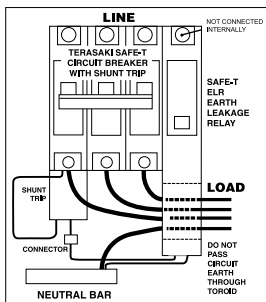
#### Test function

A test button is provided on the unit to functionally test the detection and tripping circuits. It is recommended a functional test be performed monthly.

No. of Poles	Sensitivity (mA) <sup>1)</sup>	Voltage (AC)		Cat. No.	Price \$
1	10	240	50/60 Hz	<b>ELR24010</b>	<b>570.00</b>
1	30	240	50/60 Hz	<b>ELR24030</b>	<b>570.00</b>
1	100	240	50/60 Hz	<b>ELR240100</b>	<b>570.00</b>
1	300	240	50/60 Hz	<b>ELR240300</b>	<b>570.00</b>
1	30	415-440	50/60 Hz	<b>ELR44030</b>	<b>570.00</b>

#### Technical data

- Operation: Instantaneous
- Frequency: 40-60 Hz
- Output ratings: I peak 8 A,  
I average 0.5 A
- Toroid window: 4 x 35 mm<sup>2</sup>  
(aperture diameter 35 mm)
- Dimensions: H = 152 mm  
W = 25 mm  
D = 60 mm
- Weight: 0.16 kg



**Notes:** <sup>1)</sup> Mines dept. approval for 30 mA only.

**Nuisance tripping may be experienced in VFD and motor starting applications, refer NHP.**

## Din-T series

### General features

1

#### Advantages of the Din-T series miniature circuit breakers

- Short circuit breaking capacity of 6, 10 and 15 kA at 415 V AC
- Increased rating up to 63 kA when backed up with HRC fuses  
(Refer page 9 - 10)
- Rated current range from 0.5 A to 125 A
- Silver graphite contacts
- Input connection by lifting cage terminal with capacity of up to 35 mm<sup>2</sup> giving fast and practical connection
- Output terminals offer finger and hand protection with a capacity of up to 35 mm<sup>2</sup>
- Snap fixing with two stop locations, for normal DIN rail mounting
- Approval number N17481
- Conforms to AS/NZS 60898, IEC 60898 and IEC 60947-2 as applicable

#### Brief description

The Din-T series miniature circuit breakers have inverse time delayed thermal and instantaneous magnetic trips and are suitable for mounting in distribution boards or in switchgear panels and consumer units.

#### Operation

Protection against overheating of electrical conductors, excess currents due to overload, short circuit or earth fault.

#### Application

In switching, control, distribution and measurement systems for domestic, commercial and industrial installations.

#### Tripping characteristics

##### Thermal release

In case of overload, the release is initiated by a bi-metal strip. Standards IEC 60898 and IEC 60947 define the range of release for specific overload values. Reference ambient temperatures are 30 °C and 40 °C for the respective standards.

##### Magnetic release

In case of short circuit, an electromagnet with plunger ensures instantaneous tripping. IEC 60898 describes the characteristics for the following curve types:

Curve Type	Test current	Application
B	$3 - 5 \times I_n$	Resistive loads  Protection of general distribution loads - lighting
C	$5 - 10 \times I_n$	- socket outlets - motors etc.
D	$10 - 20 \times I_n$	Protection of circuits having high inrush transient currents - high inertia motor starting - transformers - welders





## Din-T6

### Series 2-63 A

1



#### 6 kA 'C' curve


- Standard AS/NZS 60898
- Approval No. N17481
- Current range 2-63 amps 1, 2 and 3 pole
- Sealable and lockable handle
- DIN rail mounting
- Padlockable in OFF position
- Suits CD or NC chassis
- **General purpose light, power and motor starting**

#### Curve type: C (5 – 10 In)


#### Single pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6102C	35.50	20	DTCB6120C	35.50
4	DTCB6104C	35.50	25	DTCB6125C	35.50
6	DTCB6106C	35.50	32	DTCB6132C	35.50
10	DTCB6110C	35.50	40	DTCB6140C	35.50
13	DTCB6113C	35.50	50	DTCB6150C	35.50
16	DTCB6116C	35.50	63	DTCB6163C	35.50

#### Double pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6202C	126.00	20	DTCB6220C	126.00
4	DTCB6204C	126.00	25	DTCB6225C	126.00
6	DTCB6206C	126.00	32	DTCB6232C	126.00
10	DTCB6210C	126.00	40	DTCB6240C	126.00
13	 DTCB6213C	126.00	50	DTCB6250C	126.00
16	DTCB6216C	126.00	63	DTCB6263C	126.00


#### Triple pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6302C	160.00	20	DTCB6320C	160.00
4	DTCB6304C	160.00	25	DTCB6325C	160.00
6	DTCB6306C	160.00	32	DTCB6332C	160.00
10	DTCB6310C	160.00	40	DTCB6340C	160.00
13	DTCB6313C	160.00	50	DTCB6350C	160.00
16	 DTCB6316C	160.00	63	DTCB6363C	160.00

**Notes:** The LINE-side is the OFF or bottom of the MCB, and connects to CD or NC chassis tee-offs.

Suitable for the following side mounted accessories:

- AUX/ALM switches – refer page 1 - 33
- Shunt trip and UVT Trip – refer page 1 - 32
- Clip-on RCD module and Din-Safe-M module- refer page 1 - 25
- Din-T terminals and accessories – refer page 1 - 43

 Available on indent only

1

## Din-T6

### Series 2-63 A


#### 6 kA 'D' curve

- Standard AS/NZS 60898
- Approval No. N17481
- Current range 2-63 amps 1, 2 and 3 pole
- Sealable and lockable handle
- DIN rail mounting
- Padlockable in OFF position
- Suits CD or NC chassis
- **Motor starting and transformer applications**



#### Curve type: D (10 – 20 In)


#### Single pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6102D	49.00	20	DTCB6120D	49.00
4	DTCB6104D	49.00	25	DTCB6125D	49.00
6	DTCB6106D	49.00	32	DTCB6132D	49.00
10	DTCB6110D	49.00	40	DTCB6140D	52.50
13	 DTCB6113D	49.00	50	DTCB6150D	52.50
16	DTCB6116D	49.00	63	DTCB6163D	52.50

#### Double pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6202D	147.00	20	DTCB6220D	147.00
4	DTCB6204D	147.00	25	DTCB6225D	147.00
6	DTCB6206D	147.00	32	DTCB6232D	147.00
10	DTCB6210D	147.00	40	DTCB6240D	158.00
13	 DTCB6213D	147.00	50	DTCB6250D	158.00
16	DTCB6216D	147.00	63	DTCB6263D	158.00


#### Triple pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
2	DTCB6302D	205.00	20	DTCB6320D	205.00
4	DTCB6304D	205.00	25	DTCB6325D	205.00
6	DTCB6306D	205.00	32	DTCB6332D	205.00
10	DTCB6310D	205.00	40	DTCB6340D	215.00
13	 DTCB6313D	205.00	50	DTCB6350D	215.00
16	DTCB6316D	205.00	63	DTCB6363D	215.00

**Notes:** The LINE-side is the OFF or bottom of the MCB, and connects to CD or NC chassis tee-offs.

Suitable for the following side mounted accessories:

- AUX/ALM switches – refer page 1 - 33
- Shunt trip and UVT Trip – refer page 1 - 32
- Clip-on RCD module and Din-Safe-M module- refer page 1 - 25
- Din-T terminals and accessories – refer page 1 - 43

 Available on indent only

## Din-T6

2-in-1 Double the capacity of your load centre

### 6 kA 'C' curve

- Standard AS/NZS 60898
- Approval No. NSW24783
- Current range 2 - 40 A
- C curve tripping characteristics
- Saves up to 50 % space
- DIN rail mounting
- **General purpose light and power**



2 Pole

Curve type: C (5 - 10 In)

### 1 pole + 1 pole

Single module width (18 mm)

In (A)	Cat. No.	Price \$
2	DTCB-D6-11-02-C	175.00
4	DTCB-D6-11-04-C	175.00
6	DTCB-D6-11-06-C	175.00
10	DTCB-D6-11-10-C	175.00
16	DTCB-D6-11-16-C	175.00
20	DTCB-D6-11-20-C	175.00

### 2 pole

Single module width (18 mm)

In (A)	Cat. No.	Price \$
2	DTCB-D6-2-02-C	165.00
4	DTCB-D6-2-04-C	165.00
6	DTCB-D6-2-06-C	165.00
10	DTCB-D6-2-10-C	165.00
16	DTCB-D6-2-16-C	165.00
20	DTCB-D6-2-20-C	165.00
25	DTCB-D6-2-25-C	165.00
32	DTCB-D6-2-32-C	165.00
40	DTCB-D6-2-40-C	165.00

### 3 pole

Double module width (36 mm)

In (A)	Cat. No.	Price \$
2	DTCB-D6-3-02-C	265.00
4	DTCB-D6-3-04-C	265.00
6	DTCB-D6-3-06-C	265.00
10	DTCB-D6-3-10-C	265.00
16	DTCB-D6-3-16-C	265.00
20	DTCB-D6-3-20-C	265.00
25	DTCB-D6-3-25-C	265.00
32	DTCB-D6-3-32-C	265.00
40	DTCB-D6-3-40-C	265.00

### 4 pole

Double module width (36 mm)

In (A)	Cat. No.	Price \$
2	DTCB-D6-4-02-C	375.00
4	DTCB-D6-4-04-C	375.00
6	DTCB-D6-4-06-C	375.00
10	DTCB-D6-4-10-C	375.00
16	DTCB-D6-4-16-C	375.00
20	DTCB-D6-4-20-C	375.00
25	DTCB-D6-4-25-C	375.00
32	DTCB-D6-4-32-C	375.00
40	DTCB-D6-4-40-C	375.00

**Notes:** 16 mm tunnel terminals.  
 Not suitable for CD or NC chassis mounting.  
 Compatible with NHP Terasaki auxiliaries and accessories.

1

## Din-T DC

### Series 0.5-63 A

#### 6 kA 'C' curve

- Standard AS/NZS 60898
- Approval No. NSW 24265
- Current range 0.5 - 63 A 1P and 2P
- C curve tripping characteristic
- DC Voltage 250 V 1P, 500 V 2P
- AC Voltage 230 V 1P, 400 V 2P
- Sealable and lockable handle
- DIN rail mounting
- Suit CD and NC chassis
- **Solar and industrial applications**



1 Pole



2 Pole

#### Operation

Din-T DC MCBs are equipped with a permanent magnet which aids arc extinguishing under fault conditions, making this range of MCBs suitable for voltages up to 250 V DC (1 pole), 500 V DC (2 pole) and 880 V DC (4 pole). Din-T DC 1P and 2P MCBs are also suitable for AC voltages. Polarity labeling must be respected due to the permanent magnet in the MCB.

#### Curve type: C (5 – 10 $I_n$ )

##### Single pole

##### Double pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
0.5	 DTCBDC105C	121.00	0.5	 DTCBDC205C	255.00
1	DTCBDC101C	121.00	1	DTCBDC201C	255.00
2	DTCBDC102C	121.00	2	DTCBDC202C	255.00
4	DTCBDC104C	121.00	4	DTCBDC204C	255.00
6	DTCBDC106C	121.00	6	DTCBDC206C	255.00
10	DTCBDC110C	121.00	10	DTCBDC210C	255.00
16	DTCBDC116C	121.00	16	DTCBDC216C	255.00
20	DTCBDC120C	121.00	20	DTCBDC220C	255.00
25	DTCBDC125C	121.00	25	DTCBDC225C	255.00
32	DTCBDC132C	121.00	32	DTCBDC232C	255.00
40	DTCBDC140C	121.00	40	DTCBDC240C	255.00
50	DTCBDC150C	121.00	50	DTCBDC250C	255.00
63	DTCBDC163C	121.00	63	DTCBDC263C	255.00

Notes:  Available on indent only

## Din-T DC

### Series 0.5-63 A

1

#### 6 kA 'B' curve

- Standard AS/NZS60898
- Approval No. NSW 24265
- Current range 10 - 63 A 4P
- B curve tripping characteristic
- DC Voltage 880 V 4P
- Sealable and lockable handle
- DIN rail mounting
- **Solar and industrial applications**







#### Operation

Din-T DC MCBs are equipped with a permanent magnet which aids arc extinguishing under fault conditions, making this range of MCBs suitable for voltages up to 250 V DC (1 pole), 500 V DC (2 pole) and 880 V DC (4 pole). Din-T DC 1P and 2P MCBs are also suitable for AC voltages. Polarity labeling must be respected due to the permanent magnet in the MCB.

#### Curve type: B (3 – 5 $I_n$ )

#### Four pole


In (A)	Cat. No.	Price \$
10	DTCBDC410B	560.00
16	DTCBDC416B	560.00
20	DTCBDC420B	560.00
25	 DTCBDC425B	560.00
32	 DTCBDC432B	560.00
40	 DTCBDC440B	560.00
63	 DTCBDC463B	750.00

Great for  
DC (Solar)  
applications -  
New 880 V DC  
rating

**Notes:** The **LINE-side is the OFF or bottom of the MCB, and connects to NC or CD chassis tee-offs.**

Suitable for the following side mounted accessories:-

- AUX/ALM switch – refer page 1 - 33
- Shunt trip – refer page 1 - 32
- UVT trip – refer page 1 - 32
- Clip-on RCD module – refer page 1 - 25
- Din-T terminals and accessories – refer page 1 - 43

 Available on indent only

1

## Din-T10

### Series 6-63 A

#### 10 kA 'B' curve

- Standard AS/NZS 60898
- Approval No. N17481
- Current range 6 - 63 A 1, 2, and 3 pole
- Sealable and lockable handle
- DIN rail mounting
- Padlockable in OFF position
- Suits NC or CD type chassis
- **Resistive load applications**



#### Curve type: B (3 – 5 $I_n$ )

In (A)	Cat. No. <sup>1)</sup>	1 Pole Price \$	2 Pole Price \$	3 Pole Price \$
6	DTCB10 _ 06B	64.00	181.00 <span>i</span>	210.00
10	DTCB10 _ 10B	64.00	181.00	210.00
16	DTCB10 _ 16B	64.00	181.00	210.00
20	DTCB10 _ 20B	64.00	181.00	210.00
25	DTCB10 _ 25B	64.00	181.00	210.00
32	DTCB10 _ 32B	64.00	181.00	210.00
40	DTCB10 _ 40B	75.50	187.00	220.00
50	DTCB10 _ 50B	<span>i</span> 87.50	<span>i</span> 210.00	<span>i</span> 295.00
63	DTCB10 _ 63B	105.00	<span>i</span> 220.00	350.00

Great  
for long  
cable runs  
(Carpark  
lighting)

**Notes:** The **LINE-side** is the **OFF** or **bottom** of the MCB, and connects to **NC** or **CD** chassis **tee-offs**.

<sup>1)</sup> Insert No. of poles into Cat. No. space marked ' \_ ' e.g. DTCB10 3 20B = 3 P

Suitable for the following side mounted accessories:-

- AUX/ALM switch – refer page 1 - 33
- Shunt trip and UVT trip – refer page 1 - 32
- Clip-on RCD module - refer page 1 - 25
- Din-T terminals and accessories – refer page 1 - 43

i Available on indent only.

## Din-T10

### Series 0.5 - 63 A





1

#### 10 kA 'C' curve

- Standard AS/NZS 60898 <sup>3)</sup>
- Approval No. N17481
- Current range 0.5 - 63 A 1, 2, 3 and 4 pole
- Sealable and lockable handle
- DIN rail mounting
- Padlockable in OFF position
- Suits NC or CD type chassis
- **General purpose light, power and motor starting**



#### Curve type: C (5 - 10 I<sub>n</sub>)

In (A)	Cat. No. <sup>1)</sup>	1 Pole Price \$	2 Pole Price \$	3 Pole Price \$	4 Pole Price \$ <sup>2)</sup>
0.5	DTCB10 _ 05C	56.50	 173.00	205.00	 245.00
1	DTCB10 _ 01C	56.50	173.00	205.00	 245.00
2	DTCB10 _ 02C	56.50	173.00	205.00	245.00
4	DTCB10 _ 04C	56.50	173.00	205.00	245.00
6	DTCB10 _ 06C	56.50	173.00	205.00	245.00
10	DTCB10 _ 10C	56.50	173.00	205.00	245.00
13	DTCB10 _ 13C	56.50	173.00	205.00	245.00
16	 DTCB10 _ 16C	56.50	173.00	205.00	245.00
20	DTCB10 _ 20C	56.50	173.00	205.00	245.00
25	DTCB10 _ 25C	56.50	173.00	205.00	245.00
32	DTCB10 _ 32C	56.50	173.00	205.00	245.00
40	DTCB10 _ 40C	56.50	173.00	205.00	255.00
50	DTCB10 _ 50C	56.50	173.00	205.00	270.00
63	DTCB10 _ 63C	56.50	173.00	205.00	280.00


**Notes:** The LINE-side is the OFF or bottom of the MCB, and connects to NC or CD chassis tee-offs.

<sup>1)</sup> Insert No. of poles into Cat. No. space marked ' \_ ' e.g. DTCB10 3 20C = 3P

<sup>2)</sup> All poles include overcurrent and short circuit protection

<sup>3)</sup> A range of UL standard MCBs is available on indent. (ref: DTCBUL10 \_ \_ \_C)  
Suitable for the following side mounted accessories:-

- AUX/ALM switch – refer page 1 - 33
- Shunt trip and UVT trip – refer page 1 - 32
- Clip-on RCD module – refer page 1 - 25
- Din-T terminals and accessories – refer page 1 - 43

 Available on indent only.



## Din-T10

### Series 0.5 - 63 A

















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#### 10 kA 'D' curve

- Standard AS/NZS 60898
- Approval No. N17481
- Current range 0.5 - 63 A 1, 2, 3 and 4 pole
- Sealable and lockable handle
- DIN rail mounting
- Padlockable in OFF position
- Suits NC or CD type chassis
- **Motor starting and transformer applications**



#### Curve type: D (10 - 20 I<sub>n</sub>)

In (A)	Cat. No. <sup>1)</sup>	1 Pole Price \$	2 Pole Price \$	3 Pole Price \$	4 Pole Price \$ <sup>2)</sup>
0.5	DTCB10_05D	 64.00	 181.00	 210.00	-
1	DTCB10_01D	64.00	 181.00	 210.00	-
2	DTCB10_02D	64.00	 181.00	210.00	-
4	DTCB10_04D	64.00	 181.00	210.00	 255.00
6	DTCB10_06D	64.00	181.00	210.00	 255.00
10	DTCB10_10D	64.00	181.00	210.00	 255.00
13	 DTCB10_13D	64.00	181.00	210.00	 255.00
16	DTCB10_16D	64.00	181.00	210.00	 255.00
20	DTCB10_20D	64.00	181.00	210.00	255.00
25	DTCB10_25D	64.00	181.00	210.00	255.00
32	DTCB10_32D	64.00	181.00	210.00	255.00
40	DTCB10_40D	81.50	198.00	220.00	 270.00
50	DTCB10_50D	105.00	220.00	295.00	 350.00
63	DTCB10_63D	128.00	245.00	350.00	 530.00


**Notes:** The **LINE-side** is the **OFF** or **bottom** of the MCB, and connects to **NC** or **CD** chassis **tee-offs**.

<sup>1)</sup> Insert No. of poles into Cat. No. space marked ' \_ ' e.g. DTCB10 3 20D = 3P.

<sup>2)</sup> All poles include overcurrent and short circuit protection.

Suitable for the following side mounted accessories:-

- AUX/ALM switch - refer page 1 - 33
- Shunt trip and UVT trip- refer page 1 - 32
- Clip-on RCD module - refer page 1 - 25
- Din-T terminals and accessories - refer page 1 - 43

 Available on indent only.

## Din-T10H

### Series 80-125 A

1

**10 kA 'C' Curve****7.5 kA 'D' Curve**

- Standard AS/NZS 60947 - 2
- Current range 80 - 125 A 1, 2, 3 and 4 pole
- Module width = 27 mm
- DIN rail mounting
- Suits NCH or CDH hybrid type chassis
- **Industrial applications. Solar and industrial applications**

**Curve type: C (5 – 10 I<sub>n</sub>)****Single pole**

In (A)	Cat. No.	Price \$
80	<b>DINT10H180C</b>	<b>123.00</b>
100	<b>DINT10H1100C</b>	<b>146.00</b>
125	<b>DINT10H1125C</b>	<b>182.00</b>



**Double pole**

In (A)	Cat. No.	Price \$
80	<b>DINT10H280C</b>	<b>320.00</b>
100	<b>DINT10H2100C</b>	<b>335.00</b>
125	<b>DINT10H2125C</b>	<b>455.00</b>



**Triple pole**

In (A)	Cat. No.	Price \$
80	<b>DINT10H380C</b>	<b>385.00</b>
100	<b>DINT10H3100C</b>	<b>385.00</b>
125	<b>DINT10H3125C</b>	<b>570.00</b>




**Four pole <sup>1)</sup>**

In (A)	Cat. No.	Price \$
80	 <b>DINT10H480C</b>	<b>670.00</b>
100	<b>DINT10H4100C</b>	<b>670.00</b>
125	 <b>DINT10H4125C</b>	<b>1000.00</b>

**Curve type: D (10 – 20 I<sub>n</sub>)****Single pole**

In (A)	Cat. No.	Price \$
80	 <b>DINT10H180D</b>	<b>175.00</b>
100	 <b>DINT10H1100D</b>	<b>175.00</b>
125	<b>DINT10H1125D</b>	<b>200.00</b>




**Double pole**

In (A)	Cat. No.	Price \$
80	 <b>DINT10H280D</b>	<b>340.00</b>
100	 <b>DINT10H2100D</b>	<b>385.00</b>
125	 <b>DINT10H2125D</b>	<b>510.00</b>

**Triple pole**

In (A)	Cat. No.	Price \$
80	<b>DINT10H380D</b>	<b>440.00</b>
100	<b>DINT10H3100D</b>	<b>440.00</b>
125	<b>DINT10H3125D</b>	<b>630.00</b>

**Four pole <sup>1)</sup>**

In (A)	Cat. No.	Price \$
80	 <b>DINT10H480D</b>	<b>750.00</b>
100	 <b>DINT10H4100D</b>	<b>750.00</b>
125	 <b>DINT10H4125D</b>	<b>1100.00</b>


**Notes:** The **LINE-side** is the **OFF** or **bottom** of the MCB, and connects to NCH or CDH chassis **tee-offs**.

Din-T10H MCBs do not fit NC or CD chassis with 18mm pole pitch

<sup>1)</sup> All poles include overcurrent and short circuit protection.

Suitable for the following side mounted accessories:-

- AUX/ALM switch – refer page 1 - 33
- Shunt trip – refer page 1 - 32
- Din-T terminals and accessories – refer page 1 - 43

 Available on indent only.

1

## Din-T15




















### Series 6 - 63 A

#### 15 kA, 20 kA, 25 kA, 50 kA 'C' curve

- Standard AS/NZS 60947 - 2
- Current rating 6 - 63 A 1, 2, 3 and 4 pole
- Sealable and lockable handle
- DIN rail mounting
- Suits NC or CD type chassis
- **Industrial applications**



#### Curve type: C (5 - 10 In)

In (A)	Cat. No. <sup>1)</sup>	1 Pole Price \$	2 Pole Price \$	3 Pole Price \$	4 Pole Price \$ <sup>2)</sup>
6	DTCB15 _ 06C	145.00	 260.00	405.00	 470.00
10	DTCB15 _ 10C	145.00	260.00	405.00	 470.00
13	DTCB15 _ 13C	 145.00	 260.00	 405.00	 470.00
16	DTCB15 _ 16C	145.00	260.00	405.00	 470.00
20	DTCB15 _ 20C	145.00	260.00	405.00	 470.00
25	DTCB15 _ 25C	145.00	 260.00	405.00	 470.00
32	DTCB15 _ 32C	145.00	 260.00	405.00	 470.00
40	DTCB15 _ 40C	145.00	 260.00	405.00	 470.00
50	DTCB15 _ 50C	145.00	 260.00	405.00	 470.00
63	DTCB15 _ 63C	145.00	 260.00	405.00	 470.00

#### Short circuit capacity

In (A)	No. poles	Voltage (V)	Icu (kA) <sup>3)</sup>
6-25	1	240	25
	2-4	240	50
		415	25
32-40	1	240	20
	2-4	240	40
		415	20
50-63	1	240	15
	2-4	240	30
		415	15

**Notes:** The LINE-side is the OFF or bottom of the MCB, and connects to NC or CD chassis tee-offs.


<sup>1)</sup> Insert No. of poles into Cat. No. space marked ' \_ ' e.g. DTCB15 3 20C = 3P.

<sup>2)</sup> All poles include overcurrent and short circuit protection.

<sup>3)</sup> Ics = 50 % Icu.

Suitable for the following side mounted accessories:-

- AUX/ALM switch – refer page 1 - 33
- Shunt trip and UVT trip – refer page 1 - 32
- Clip-on RCD module – refer page 1 - 25
- Din-T terminals and accessories – refer page 1 - 43

 Available on indent only.

## Din-T6

### Easy-Fit MCB & RCCBs – Tool-free connection

1

#### 6 kA 'C' curve

- Standard AS/NZS 60898
- Current range 2 - 63 A
- C curve tripping characteristic
- Cable clamping technology
- Line side- Plug in or screw in busbar comb
- Load side- Screw-less cable connection up to 20 A
- DIN rail mounting
- **General purpose light and power**













NEW



#### Curve type: C (5 – 10 In)

##### Single pole




##### Triple pole

In (A)	Cat. No.	Price \$	In (A)	Cat. No.	Price \$
6	 <b>DTCB-E6-1-06-C<sup>1)</sup></b>	39.00	6	 <b>DTCB-E6-3-06-C<sup>1)</sup></b>	160.00
10	<b>DTCB-E6-1-10-C<sup>1)</sup></b>	39.00	10	 <b>DTCB-E6-3-10-C<sup>1)</sup></b>	160.00
16	<b>DTCB-E6-1-16-C<sup>1)</sup></b>	39.00	16	 <b>DTCB-E6-3-16-C<sup>1)</sup></b>	160.00
20	<b>DTCB-E6-1-20-C<sup>1)</sup></b>	39.00	20	 <b>DTCB-E6-3-20-C<sup>1)</sup></b>	160.00
25	<b>DTCB-E6-1-25-C<sup>2)</sup></b>	39.00	25	 <b>DTCB-E6-3-25-C<sup>2)</sup></b>	160.00
32	<b>DTCB-E6-1-32-C<sup>2)</sup></b>	39.00	32	 <b>DTCB-E6-3-32-C<sup>2)</sup></b>	160.00
40	 <b>DTCB-E6-1-40-C<sup>2)</sup></b>	39.00	40	 <b>DTCB-E6-3-40-C<sup>2)</sup></b>	160.00
50	 <b>DTCB-E6-1-50-C<sup>2)</sup></b>	39.00	50	 <b>DTCB-E6-3-50-C<sup>2)</sup></b>	160.00
63	<b>DTCB-E6-1-63-C<sup>2)</sup></b>	39.00	63	 <b>DTCB-E6-3-63-C<sup>2)</sup></b>	160.00

#### Din-Safe RCD

- Standard AS/NZS 61008
- Current range 40 - 63 A
- 2 pole and 4 pole configurations
- 30 mA sensitivity
- Cable clamping technology
- Line side- Screw terminal
- Load side- Screw terminal or plug in busbar comb
- DIN rail mounting


Reduced  
installation  
time

No. poles	Trip sens.	Amp rating	Voltage	Cat. No.	Price \$
2P (1P+N)	30 mA	40 A	240 V	<b>DSRCD-E-2-40-30</b>	240.00
		63 A	240 V	 <b>DSRCD-E-2-63-30</b>	275.00
4P (3P+N)	30 mA	40 A	240/415 V	 <b>DSRCD-E-4-40-30</b>	325.00
		63 A	240/415 V	 <b>DSRCD-E-4-63-30</b>	345.00

**Notes:** <sup>1)</sup> Screw-less cable clamping 'load-side' connection.

<sup>2)</sup> Screw 'load-side' connection.

Double Pole and D Curve available on request.

 Available on indent only.





## Din-Safe

### Safety switches (RCCB)


High  
immunity  
type




- Standard AS/NZS 61008
- Approval No. N17482
- Current ratings 40, 63, 80 and 100 A
- 2 and 4 pole configuration
- Accepts Din-T side mounting accessories
- Handle sealable and padlockable

No. poles	Trip sens.	Amp rating	Voltage	Cat. No.	Price \$
2P (1P+N)	30 mA	40 A	240 V	DSRCD-2-40-30 <sup>1)</sup>	230.00
		63 A	240 V	DSRCD-2-63-30 <sup>1)</sup>	255.00
		80 A	240 V	DSRCD-2-80-30 <sup>1)</sup>	285.00
	100 mA	40 A	240 V	 DSRCD-2-40-100 <sup>1)</sup>	280.00
		80 A	240 V	DSRCD-2-80-100 <sup>1)</sup>	340.00
	300 mA	40 A	240 V	DSRCD-2-40-300 <sup>1)</sup>	320.00
		80 A	240 V	 DSRCD-2-80-300 <sup>1)</sup>	355.00
	4P (3P+N)	40 A	415 V	DSRCD-4-40-30 <sup>1)</sup>	305.00
		63 A	415 V	DSRCD-4-63-30 <sup>1)2)</sup>	325.00
		80 A	415 V	 DSRCD-4-80-30 <sup>1)</sup>	360.00
		100 A	415 V	DSRCD-4-100-30 <sup>1)</sup>	540.00
		40 A	415 V	DSRCD-4-40-100 <sup>1)</sup>	330.00
		63 A	415 V	DSRCD-4-63-100 <sup>1)2)</sup>	410.00
		80 A	415 V	DSRCD-4-80-100 <sup>1)</sup>	460.00
		100 A	415 V	DSRCD-4-100-100	540.00
		40 A	415 V	DSRCD-4-40-300	355.00
		100 A	415 V	DSRCD-4-100-300	540.00
		100 A	415 V	 DSRCD-4-100-500	550.00
		125 A	415 V	DSRCD-4-125-500B	2680.00

#### High immunity type


2P (1P+N)	30 mA	40 A	240 V	DSRCD-2-40-30AI	280.00
		63 A	240 V	 DSRCD-2-63-30AI	325.00
4P (3P+N)	30 mA	40 A	415 V	DSRCD-4-40-30AI	335.00
		63 A	415 V	DSRCD-4-63-30AI	420.00

#### Selective type

2P (1P+N)	100 mA	63 A	240 V	DSRCD-2-63-100S	350.00
	300 mA	63 A	240 V	DSRCD-2-63-300S	385.00
4P (3P+N)	100 mA	63 A	415 V	 DSRCD-4-63-100S	430.00
		100 A	415 V	DSRCD-4-100-100S	590.00
	300 mA	63 A	415 V	DSRCD-4-63-300S <sup>2)</sup>	495.00
		100 A	415 V	DSRCD-4-100-300S	600.00

**Notes:** <sup>1)</sup> Insert 'A' at end of catalogue number for type A RCD e.g. DSRCD-2-40-30 A.

<sup>2)</sup> Insert 'B' at end of catalogue number for type B RCD e.g. DSRCD-2-40-30 B.

 Available on indent only.

30 mA tripping characteristics:  $0.5 \times \Delta n = \text{no tripping}$ ,  $1 \times \Delta n = T \leq 300 \text{ ms}$ ,

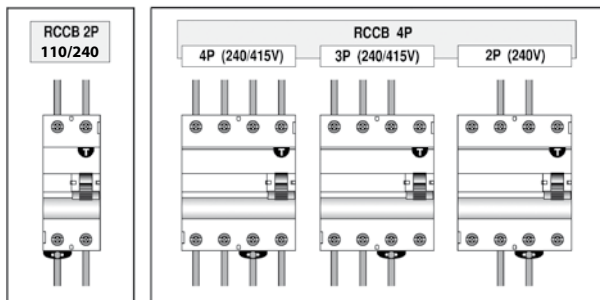
$2 \times \Delta n = T \leq 150 \text{ ms}$ ,  $5 \times \Delta n = T \leq 40 \text{ ms}$

## Din-Safe

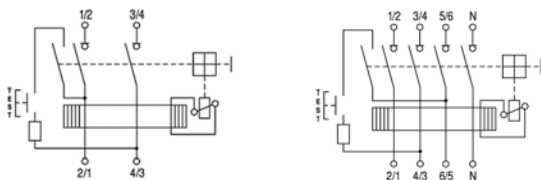
### Safety switches (RCCB)

1

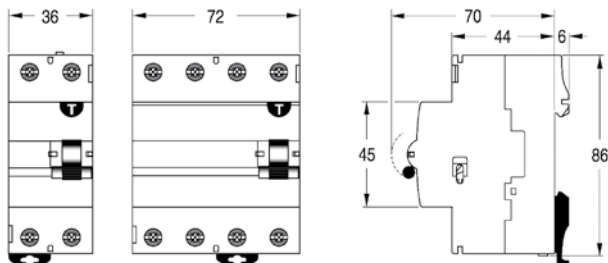
#### Connection details



#### Circuit diagrams



#### Dimensions (mm)



1

## Din-Safe

Compact single pole width residual current circuit breaker (RCBO)  
 Same dimensions as a standard MCB

### 6 kA 'C' curve

- Standard AS/NZS 61009
- Approval No. NSW24576
- Current range 6 - 32 A
- C curve tripping characteristic
- Short circuit, overcurrent and earth leakage protection
- Sensitivity 30 mA
- DIN rail mounting
- Dual DIN clip
- Suits NC and CD chassis
- Suitable for loadcenters and panelboards
- General purpose light and power



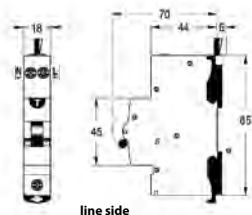
### Curve type: C (5 – 10 In)

In (A)	Modules (18 mm)	Voltage (AC)	Short circuit cap. (kA)	Trip sens. (mA)	Cat. No. <sup>1)2)</sup>	Price \$
6	1	240	6	30	DSRCB-S-06-30-C	310.00
10	1	240	6	30	DSRCB-S-10-30-C	310.00
16	1	240	6	30	DSRCB-S-16-30-C	310.00
20	1	240	6	30	DSRCB-S-20-30-C	310.00
25	1	240	6	30	DSRCB-S-25-30-C	310.00
32	1	240	6	30	DSRCB-S-32-30-C	310.00

### Accessories

Description	Cat. No.	Price \$
Auxiliary, 1 change-over contact 5 A	DSRCBSAX	98.00
Auxiliary/Alarm, 1 selectable change over contact	DSRCBSAXAL	110.00

### Dimensions (mm)



### Connection diagram



**Notes:** <sup>1)</sup> Insert 'A' at end of part number for Type A RCD e.g. DSRCBS-20-30-CA.

<sup>2)</sup> Neutral not switched.

30 mA tripping characteristics:  $0.5 \times I_{\Delta n} = \text{no tripping}$ ,  $1 \times I_{\Delta n} = T \leq 300 \text{ ms}$   
 $2 \times I_{\Delta n} = T \leq 150 \text{ ms}$ ,  $5 \times I_{\Delta n} = T \leq 40 \text{ ms}$

**Nuisance tripping may be experienced in VFD and motor starting applications refer NHP.**

## Din-Safe

### Single pole width residual current circuit breaker (RCBO)

1

#### 10 kA

- Standard AS/NZS 61009
- Approval No. N17482
- One module wide (18 mm)
- Short circuit, overcurrent and earth leakage protection
- Short circuit capacity 10 kA
- Sensitivity 10 and 30 mA
- Suits NC or CD chassis
- Type 'A' RCD

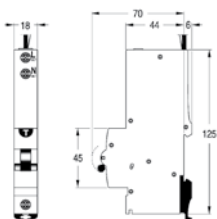
New  
improved  
higher  
immunity to  
harmonics



#### Curve type: C (5 – 10 In)

In (A)	Modules (18 mm)	Voltage (AC)	Short circuit cap. (kA)	Trip sens. (mA)	Cat. No. <sup>1)</sup> 2)	Price \$
6	1	240	10	30	DSRCBH-06-30A	299.00
10	1	240	10	30	DSRCBH-10-30A	299.00
16	1	240	10	30	DSRCBH-16-30A	299.00
20	1	240	10	30	DSRCBH-20-30A	299.00
25	1	240	10	30	DSRCBH-25-30A	299.00
32	1	240	10	30	DSRCBH-32-30A	299.00
40	1	240	10	30	DSRCBH-40-30A	299.00
6	1	240	10	10	<i>i</i> DSRCBH-06-10A	385.00
10	1	240	10	10	DSRCBH-10-10A	385.00
16	1	240	10	10	DSRCBH-16-10A	385.00
20	1	240	10	10	DSRCBH-20-10A	385.00
25	1	240	10	10	<i>i</i> DSRCBH-25-10A	385.00
32	1	240	10	10	<i>i</i> DSRCBH-32-10A	385.00
40	1	240	10	10	<i>i</i> DSRCBH-40-10A	385.00

#### Dimensions (mm)



line side

#### Connection diagram



**Notes:** The LINE-side is the OFF or bottom of the MCB, and connects to CD chassis tee-offs.

<sup>1)</sup> Neutral not switched.

<sup>2)</sup> Will not accept Din-T side mounting accessories.

*i* Available on indent only.

30 mA tripping characteristics:  $0.5 \times I_{\Delta n} = \text{no tripping}$ ,  $1 \times I_{\Delta n} = T \leq 300 \text{ ms}$

$2 \times I_{\Delta n} = T \leq 150 \text{ ms}$ ,  $5 \times I_{\Delta n} = T \leq 40 \text{ ms}$

Nuisance tripping may be experienced in VFD and motor starting applications refer NHP.



1

## Din-Safe MCB (RCBO)



### 10 kA MCB without Pigtail (RCBO)

- Standard AS/NZS 61009
- Approval No. N17482
- Switched neutral
- Suits 3 P+N NC chassis or special CD chassis
- Suits loadcenters

Din-Safe MCB is a combined MCB/RCD providing overload, short circuit and earth leakage protection in the one integral unit.

### Curve type: C (5 – 10 I<sub>n</sub>)

Trip sens mA	No. of poles	Voltage	Phase	I <sub>n</sub> (A)	Cat. No.	Price \$
30 mA	2 Pole	110/240	1 P+N	6	<b>DSRCB-06-30</b>	<b>265.00</b>
				10	<b>DSRCB-10-30<sup>1)</sup></b>	<b>265.00</b>
				16	<b>DSRCB-16-30<sup>1)</sup></b>	<b>265.00</b>
				20	<b>DSRCB-20-30<sup>1)</sup></b>	<b>265.00</b>
				25	<b>DSRCB-25-30<sup>1)</sup></b>	<b>265.00</b>
				32	<b>DSRCB-32-30<sup>1)</sup></b>	<b>265.00</b>
				40	<b>DSRCB-40-30<sup>1)</sup></b>	<b>265.00</b>
10 mA	2 Pole	110/240	1 P+N	6	<b>DSRCB-06-10A<sup>2)</sup></b>	<b>275.00</b>
				10	<b>DSRCB-10-10A<sup>2)</sup></b>	<b>275.00</b>
				16	<b>DSRCB-16-10A<sup>2)</sup></b>	<b>275.00</b>
				20	<b>DSRCB-20-10A<sup>2)</sup></b>	<b>275.00</b>
100 mA	2 Pole	110/240	1 P+N	10	<b>DSRCB-10-100<sup>1)</sup></b>	<b>280.00</b>
				16	<b>DSRCB-16-100<sup>1)</sup></b>	<b>280.00</b>
				20	<b>DSRCB-20-100<sup>1)</sup></b>	<b>280.00</b>

### 10 kA MCB with Pigtail (RCBO)

- Standard AS/NZS 61009
- Approval No. N17482
- Un-switched neutral
- Suits NC or CD chassis

Complete with revised terminal configuration and neutral pigtail, will fit standard Din-T 3 ph NC or CD chassis.

### Curve type: C (5 – 10 I<sub>n</sub>)

Trip sens mA	No. of poles	Voltage (AC)	Phase	I <sub>n</sub> (A)	Cat. No. <sup>1)</sup>	Price \$
30 mA	2 Pole	110/240	1P+N	6	<b>DSRCB-06-30P</b>	<b>270.00</b>
				10	<b>DSRCB-10-30P</b>	<b>270.00</b>
				16	<b>DSRCB-16-30P</b>	<b>270.00</b>
				20	<b>DSRCB-20-30P</b>	<b>270.00</b>
				25	<b>DSRCB-25-30P</b>	<b>270.00</b>
				32	<b>DSRCB-32-30P</b>	<b>270.00</b>
				40	<b>DSRCB-40-30P</b>	<b>270.00</b>

**Notes:** <sup>1)</sup> Insert 'A' at end of catalogue number for type A RCD e.g. DSRCB-20-30A.  
For pricing please contact NHP.

<sup>2)</sup> Type A RCD

30 mA tripping characteristics: 0.5 x I<sub>Δn</sub> = no tripping, 1 x I<sub>Δn</sub> = T ≤ 300 ms

2 x I<sub>Δn</sub> = T ≤ 150 ms, 5 x I<sub>Δn</sub> = T ≤ 40 ms



## Din-Safe-M

### Add-on earth leakage modules

1

- Standard AS/NZS 3190
- Current ratings 32 and 63 amps
- Sensitivity  $I_{\Delta n}$  30, 100 and 300 mA
- Suits Din-T6, 10 and 15

#### Tripping characteristics

0.5 x $I_{\Delta n}$	no tripping
1 x $I_{\Delta n}$	$t \leq 300$ ms
5 x $I_{\Delta n}$	$t \leq 40$ ms



#### Din-Safe-M modules to suit Din-T6, 10 and 15

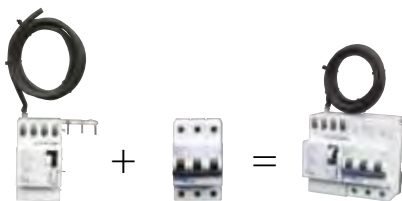
No. of poles <sup>1)</sup>	Sensitivity	MCB rating <sup>3)</sup>	Width mods. <sup>2)</sup>	Cat. No. <sup>1)</sup>	Price \$
1P+N <sup>4)</sup>	30 mA	32 A	2	<b>DSRCM-32-30-1PN</b>	<b>420.00</b>
		63 A	2	<b>DSRCM-63-30-1PN</b>	<b>530.00</b>
	100 mA	32 A	2	<b>DSRCM-32-100-1PN</b>	<b>440.00</b>
		63 A	2	<b>DSRCM-63-100-1PN</b>	<b>550.00</b>
	300 mA	32 A	2	<b>DSRCM-32-300-1PN</b>	<b>495.00</b>
		63 A	2	<b>DSRCM-63-300-1PN</b>	<b>600.00</b>
3P	30 mA	63 A	3	<b>DSRCM-63-30-3P</b>	<b>570.00</b>
	100 mA	63 A	3	<b>DSRCM-63-100-3P</b>	<b>620.00</b>
3P + N	30 mA	32 A	2	<b>DSRCM-32-30-3PN</b>	<b>475.00</b>
		63 A	3	<b>DSRCM-63-30-3PN</b>	<b>560.00</b>
	100 mA	32 A	2	<b>DSRCM-32-100-3PN</b>	<b>560.00</b>
		63 A	3	<b>DSRCM-63-100-3PN</b>	<b>620.00</b>
	300 mA	32 A	2	<b>DSRCM-32-300-3PN</b>	<b>560.00</b>
		63 A	3	<b>DSRCM-63-300-3PN</b>	<b>620.00</b>

- Notes:**
- <sup>1)</sup> 1P+N and 3P+N type supply neutral connected by 'pigtail' cable.
  - <sup>2)</sup> Dimensions of Din-Safe-M unit only; add MCB width for total installed width.
  - <sup>3)</sup> 'MCB rating' refers to the max. MCB rating the module can be fitted to.
  - <sup>4)</sup> 1P + N suitable for 415 V 2P applications.  
Not suitable for Din-T10H MCBs.

1

## Din-Safe-M

Modules to be combined with Din-T MCBs



- Din-Safe-M modules are an earth leakage module only. To complete the functional unit a Din-T6, Din-T10 or Din-T15 MCB must be added as shown.

### Din-Safe-M space requirements

Type	Without MCB fitted neutral not switched	MCB fitted neutral not switched	MCB fitted neutral switched
1P + N 32/63 A	2 modules (36 mm)	3 modules (54 mm)	4 modules (72 mm)
3P + N 32 A	2 modules (36 mm)	5 modules (90 mm)	6 modules (108 mm)
3P + N 63 A	3 modules (54 mm)	6 modules (108 mm)	7 modules (126 mm)
3P 63 A	3 modules (54 mm)	6 modules (108 mm)	N/A

### Operation

The combined Din-T MCB/Din-Safe-M earth leakage module has two operating toggles which indicate the reason for the trip action taking place.

- When an overload or short circuit occurs the Din-T MCB will operate. In this case the Din-Safe-M toggle will remain in the ON position.
- If an earth leakage fault occurs both toggles will move to the OFF position. In order to reset the MCB the Din-Safe-M unit must be reset first.
- In both instances – if the cause of the trip operation has not been rectified, a trip operation will occur as soon as the MCB is turned to the ON position. The trip free mechanism of the MCB ensures that a successful trip operation takes place even when the toggle is held in the ON position.

### Assembly

- Place the MCB and Din-Safe-M unit on a flat surface. Be sure that both the MCB and the Din-Safe-M toggles are in the ON position.
- Slide the two units towards each other inserting the connecting bars or links into the MCB tunnel terminal, ensuring no undue pressure is applied to the metal tripping pin of the Din-Safe-M unit.
- Push in the connecting clips, locking the unit together.
- Check that the MCB trips when the toggle on the Din-Safe-M is moved to the OFF position.
- Tighten the busbar connections between the MCB and the Din-Safe-M and fit the insulating cover supplied.
- If the pigtail and N connections are reversed, the breaker will trip as soon as load is energised. Reset Din-Safe-M module before switching MCB 'ON'.
- In the case of a three phase 3 wire system (no neutral) use 3 phase models. 3P+N models will operate satisfactorily but test button will only function if neutral pigtail is connected.

## Din-Safe-M

### Modules to be combined with Din-T MCBs

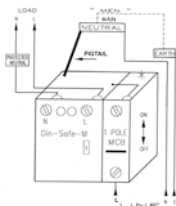
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#### Testing

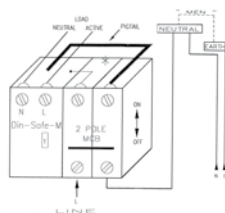
The MCB/Din-Safe-M combination must be connected with the line conductors to the LINE side (OFF/Bottom side) of the MCB and the load conductors connected to the Din-Safe-M terminals. The MCB/Din-Safe-M combination must be tested with the supply connected before connecting the load. First switch the Din-Safe-M unit 'ON' then the MCB. When the test button is pressed, both handles should trip. It is recommended that the test button is operated periodically to test the detection and tripping functions of the combined unit.

- Both 1P+N and 3P+N models have a neutral pigtail connection. 3P modules have no neutral connection at all.

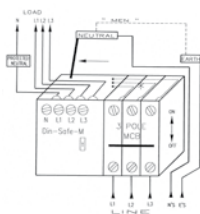
#### Din-Safe-M 1P+N with 1 pole MCB (neutral not switched)



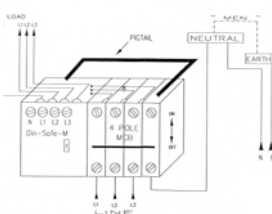
#### Din-Safe-M 1P+N with 2 pole MCB switching active and neutral



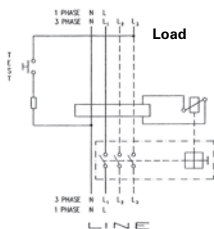
#### Din-Safe-M 3P+N with 3 pole MCB (neutral not switched)



#### Din-Safe-M 3P+N with 4 pole MCB switching active and neutral



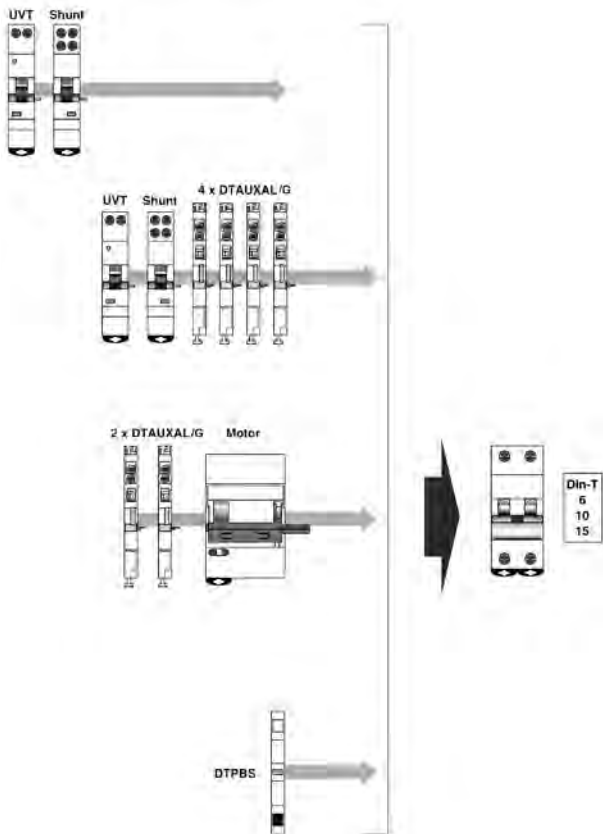
#### Connection diagram



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## Accessories

Mounting on the left-hand side

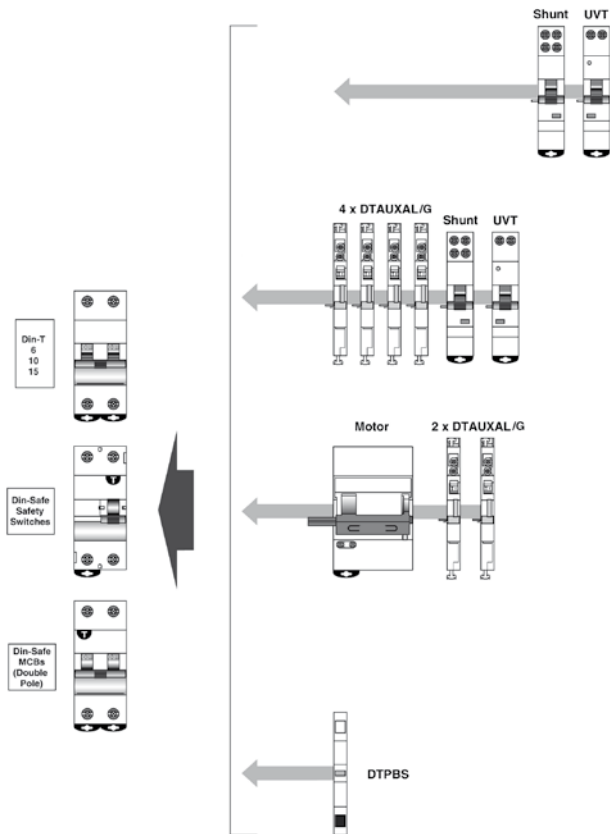


**Notes:** The above accessories will not fit to Din-T10H MCBs.  
Refer to pages 1 - 32 and 1 - 33 for suitable shunts and auxiliaries.

## Accessories

Mounting on the right-hand side

1



**Notes:** DSRCBH - Single pole RCD/MCB will not accept side mounted accessories.  
DINTMS - Main switches will accept side mounting auxiliary contacts only.

## 1

## Accessories

Mounting of add-on devices onto MCBs, RCCBs and RCBOs

Type/Description	Din-T, DC, 6, 10, 15	Din-T 10H	DSRCB, DSRCD	DSRCM	DINTMS	Change -over switch
<b>DTAUXAL</b> Signal or AUX contact	L - R	—	R	R	L - R	L - R
<b>DTAUXALG</b> Signal or AUX contact, gold	L - R	—	R	R	L - R	L - R
<b>DINT10HHS</b> Signal or AUX + AUX contact	—	R	—	—	—	—
<b>DTPBS</b> Panelboard switch	L - R	—	R	—	—	—
<b>DINTSHT</b> Shunt trip	—	L	—	—	—	—
<b>DTSHT</b> Shunt trip	L - R	—	R	R	—	—
<b>DTUVT</b> Undervoltage trip	L - R	—	R	R	—	—
<b>DTMD</b> Motor operator	L - R	—	R	R	—	—

L = Left mounting    R = Right mounting

### Din-TMS 63-100 A

#### Main switch DIN rail mount

- Standard IEC 60947-3
- Double-break contacts
- Padlockable handle
- Handle sealable in ON and OFF position
- DIN rail mount
- Suits NC or CD type chassis

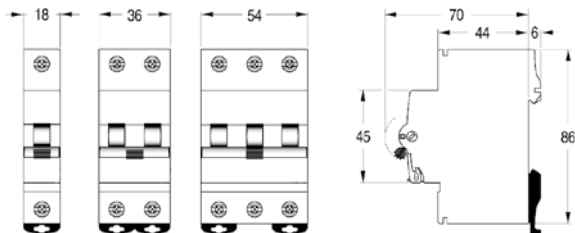


Din-T main switches have the same profile as Din-T MCBs and are suitable for use as a main switch (isolator) in loadcentres and distribution boards

No. of poles	Rated current (A)	Cat. No.	Price \$
1	63	DINTMS631	40.50
	80	DINTMS801	43.50
	100	DINTMS1001	46.50
2	63	DINTMS632	54.00
	80	DINTMS802	64.50
	100	DINTMS1002	72.50
3	63	DINTMS633	83.50
	80	DINTMS803	98.00
	100	DINTMS1003	111.00

63 A - 100 A  
side mounts to  
NC chassis  
63 A - 80 A side  
mounts to  
CD chassis

#### Dimensions (mm)



**Notes:** AUX/ALM switch - refer page 1 - 33

**The LINE-side is the OFF or bottom of the isolator, and connects to NC or CD chassis tee-offs.**



# 1

## Din-T

### Shunt and undervoltage trip

#### Din-T shunt trip

- Couples to left or right side of MCB
- Modular width – 18 mm
- Busbar cavity both ends
- Field assembly
- Continuously rated
- Terminals for remote indication

#### Operation

The shunt trip makes it possible to remotely switch the MCB by energising C1 & C2 terminals of the shunt trip.



DTSHT 110415V

#### Shunt trip - Din-T6, 10 & 15

Rated voltage	Current rating	Operating time (ms)	Cat. No.	Price \$
110 to 415 V AC	110 V - 0.3 A	10	<b>DTSHT-110-415V</b>	<b>152.00</b>
110 to 125 V DC	240 V - 0.6 A	4		
	415 V - 1.0 A	2		
24 to 60 V AC	24 V - 1.0 A	10	<b>DTSHT-24-60V</b>	<b>152.00</b>
24 to 48 V DC	48 V - 2.0 A	4		

#### Shunt trip - Din-T 10H

Rated voltage	Current rating	Operating time (ms)	Cat. No. <sup>1)</sup>	Price \$
110 to 415 V AC	110 V - 0.3 A	10	<b>DINTSHT110415U</b>	<b>158.00</b>
110 to 125 V DC	240 V - 0.6 A	4		
	415 V - 1.0 A	2		
24 to 60 V AC	24 V - 1.0 A	10	<b>DINTSHT2460U</b>	<b>158.00</b>
24 to 48 V DC	48 V - 2.0 A	4		

#### Din-T undervoltage trip <sup>2)</sup>

- Couples to left or right side of MCB
- Modular width – 18 mm
- Busbar cavity both ends
- Field assembly


The Din-T UVT trips the MCB when the operating voltage threshold is lower than  $0.5 \times U_n$ . Adjustable time delay up to 300 ms eliminates nuisance tripping.



Rated voltage	Cat. No.	Price \$
230 V AC	<b>DTUVT240VAC</b>	<b>165.00</b>
12 V AC/DC	<b>DTUVT12VDC</b>	<b>165.00</b>
24 V AC/DC	<b>DTUVT24VDC</b>	<b>165.00</b>
48 V AC/DC	<b>DTUVT48VDC</b>	<b>165.00</b>

**Notes:** <sup>1)</sup> Shunt fits to left side of Din-T10H MCBs only.

<sup>2)</sup> UVT does not suit Din-T10H MCBs.

 Available on indent only.

## Din-T

### Auxiliary contacts for MCBs

1

- Suitable for Din-T 6, 10 & 15
- Suitable for 2P RCBO and 2P & 4P RCCB <sup>1)</sup>
- Stack up to 4 units left or right side
- Field fittable, includes all fitting accessories
- Includes busbar cavity for chassis mounting
- Changeover contact
- Current rating 5 A



DTAUXAL

#### Din-T auxiliary contact - Din-T 6, 10, 15

Contact function	Contact material	Module width	Cat. No.	Price \$
H or S	Silver	0.5	<b>DTAUXAL</b>	<b>98.00</b>
H or S	Gold	0.5	<b>DTAUXALG</b>	<b>119.00</b>

'H' = auxiliary switch 'S' = alarm switch

#### Din-T auxiliary contact - Din-T10H

Contact function	Contact material	Module width	Cat. No.	Price \$
H+H/S	Silver	0.5	<b>DINT10H - HS <sup>2)</sup></b>	<b>110.00</b>

#### Din-T motor operator DTMD

- Suitable for Din-T 6, 10 & 15
- Suitable for 2P RCBO and 2P & 4P RCCB <sup>3)</sup>
- AUX contact stacks up to 4 left and right side
- Field fittable, includes all fitting accessories
- Fits left or right side of device
- Padlockable in the OFF position
- Manual operation is possible



DTMD240VAC

Rated Voltage	Module width	Cat. No.	Price \$
230 V AC	3	<b>DTMD240VAC <sup>3)</sup> <sup>4)</sup> <sup>5)</sup></b>	<b>640.00</b>

#### Technical

Rated voltage Un	240 V AC
Impulse to switch ON/OFF	>50 ms
Closing time	500 ms
Opening time	200 ms
Electrical endurance	10,000 ops
Terminal capacity	2.5 mm <sup>2</sup>
Weight	380 g

- Notes:**
- <sup>1)</sup> DTAUXAL type contact fits right side only on 2P RCBO and 2/4P RCCB.
  - <sup>2)</sup> Auxiliary contacts for Din-T10H MCBs are not stackable and fit to right side only.
  - <sup>3)</sup> DTMD240VAC fits right side only on 2P RCBO and 2/4P RCCB.
  - <sup>4)</sup> DTMD240VAC is not suitable for use with Din-T10H MCBs.
  - <sup>5)</sup> Price Schedule 'T4'

1

## DIN mount housing to suit 22.5 mm devices



- DIN rail mount
- Mounts 22.5 mm panelmount devices
- Suitable for loadcentres and panelboards

Holder is DIN rail mounted, and is designed to allow mounting of 22.5 mm panelmount devices in loadcentres and Concept family of panelboards. Ideal for mounting pilot lights, pushbuttons and key selector switches.

Description	Cat. No.	Price \$
Holder DIN profile suit 22.5 mm devices	<b>M22IVS</b>	<b>22.60</b>

### Panelboard switch (DTPBS)

The panelboard switch coupled to a main device is intended to switch off any 2 - 63 A MCB in case the front cover of the enclosure is removed. It is a mechanical safety device, which reduces the risk of electric shock in case of manipulation of the panelboard.

The panelboard switch can easily be coupled either to the right or left-hand side of the main device, according to the instructions below.

No. modules wide <sup>1)</sup>	Cat. No.	Price \$
0.5	<b>DTPBS</b>	<b>57.00</b>

### Kilowatt Hour Meters

- 8 Digit LCD
- Displays - Total active energy
  - Total reactive energy
  - Partial active energy
  - Partial reactive energy
  - Power demand
  - Maxium demand (power)
- Active energy: Class 1
- Input current 1 A or 5 A CT



CE4DT04A2

No. modules wide <sup>1)</sup>	Cat. No. <sup>2)</sup>	Price \$
KWH meter DIN 4 module	<b>CE4DT 14A2</b>	<b>540.00</b>
KWH meter DIN 4 module (CUMMS)	<b>CE4DT 14A6</b>	<b>620.00</b>

**Notes:** <sup>1)</sup> 'DTSP' - 0.5 module width spacer available if required when DTPBS used.

<sup>2)</sup> CE4DT Price Schedule 'Y8'.

## Busbar comb

Din-T MCBs

1

**Current rating 100 A**

**Pin type busbars**



No. of poles	1 Phase <sup>1)</sup> Cat. No.	Price \$	3 Phase Cat. No.	Price \$
8 Way	IBC108P	10.20	-	-
12 Way	IBC112P	17.20	ICL123	47.00
15 Way	IBC115P	20.50	ICL153	59.00
18 Way	IBC118P	28.50	ICL183	70.00
21 Way	IBC121P	34.50	ICL213	91.00
55 Way	IBC155P	74.50	-	-
57 Way	-	-	ICL573	215.00

### Pin type busbar

	Cat. No.	Price \$
1P+N 56 Way pin type busbar comb	ICL562	123.00
1P+N 6 Way pin type busbar comb	ICL62	17.60
1P+N 10 Way pin type busbar comb	ICL102	25.00
3P+Aux 56 Way pin type busbar comb	ICL563A <sup>2)</sup>	194.00
3P+N 56 Way pin type busbar comb	ICL564	245.00



### Fork type busbar

	Cat. No.	Price \$
56 Way 1 phase fork type busbar comb	ICL561F	75.00
57 Way 3 phase fork type busbar comb	ICL573F	220.00

### End caps

	Cat. No.	Price \$
1P end cap to suit IBC style buscomb	IBCEC1	1.90
2P and 3P end cap to suit ICL style buscomb	ICLEC23 <sup>3)</sup>	3.90
3P+N end cap to suit ICL style buscomb	ICLEC4 <sup>3)</sup>	3.90



ICL123



ICLTOC  
T-off cap (strip of 5)



ICL573F

**Notes:** <sup>1)</sup> IBC busbar combs come complete with endcaps.

<sup>2)</sup> 16 x 3 MCB connections and 16 x 9 mm spaces (AUXs).



<sup>3)</sup> ICL end caps do not suit IBC busbar combs.

1



**Din-T****Modular changeover switch**

- Standard IEC 60669 - 1
- Handle sealable and lockable in ON or OFF position
- Terminal protection IP 20
- Captive terminal screws with cross head

**Without OFF I - II**

In (A)	No. of Poles	No. of Modules	Connection	Cat. No.	Price \$
32	1	1		<b>DTCS-32-12</b>	<b>46.00</b>
32	2	1		<b>DTCS-32-22</b>	<b>69.00</b>

**With OFF I - O - II**

In (A)	No. of Poles	No. of Modules	Connection	Cat. No.	Price \$
32	1	1		<b>DTCS-32-13</b>	<b>57.00</b>
32	2	1		<b>DTCS-32-23</b>	<b>80.00</b>

**Din-T****Pushbuttons and pilot lights**

- Modular size
- DIN rail mounting
- Terminal protection IP 20
- Contacts, 16 A @ 250 V AC



Description	No. of Poles	No. of Modules	Contacts	Cat. No.	Price \$
Pushbutton	2	1	N/O + N/C	<b>DTPB11</b>	<b>34.00</b>
Pushbutton illuminated	1	1	N/O	<b>DTPB10L <sup>1)</sup></b>	<b>52.00</b>
Pilot light base	1	1		<b>DTPLB <sup>2)</sup></b>	<b>24.50</b>
Lamp 240 V neon	-	-		<b>DTPLL240</b>	<b>3.50</b>
Lamp 24 V (filament)	-	-		<b>DTPLL24</b>	<b>3.50</b>
Lens red	-	-		<b>DTPLLRD</b>	<b>3.20</b>
Lens green	-	-		<b>DTPLLGR</b>	<b>3.20</b>
Lens orange	-	-		<b>DTPLLOR</b>	<b>3.20</b>
Lens clear	-	-		<b>DTPLLCL</b>	<b>3.20</b>

**Notes:** <sup>1)</sup> Order lens separately. 240 V lamp built-in and cannot be changed.

<sup>2)</sup> Order lens and lamp separately.

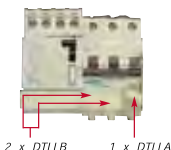
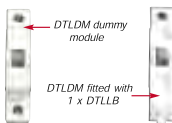
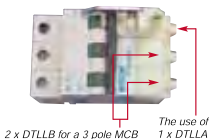
## LockDIN™

1

Din-T lockdogs provide a captive locking attachment for Din-T MCB's and RCD's.

The system is designed to be used in conjunction with Concept Premier and Concept Tough Panelboards. If a switchboard is being specifically designed to accommodate the new LOCK DIN™, then extra depth is required between escutcheon and door to accommodate the padlocks being used on site.

The LOCK DIN™ is designed to be clipped onto the line side of the MCB. This requires the line terminal screw to be tightened before installation. The escutcheon cut out needs to be increased by 16 mm over the line terminal to allow for the extended profile of the MCB with the LOCK DIN™ fitted.



**LockDIN™**

1

Description	Cat. No.	Price \$
<b>Locking devices</b>		
LH locking assembly for MCBs and single pole RCBOs	<b>DTLLA</b>	<b>49.00</b>
RH locking assembly for MCBs and single pole RCBOs	<b>DTLLARH</b>	<b>49.00</b>
LH locking assembly for 2 pole RCBOs	<b>DTLLAB</b>	<b>49.00</b>
RH locking assembly for 2 pole RCBOs	<b>DTLLABRH</b>	<b>49.00</b>
Locking assembly for DINT-10H MCB	<b>DTLLA10H</b>	<b>59.00</b>
12 pack LH locking assembly for MCBs and single pole RCBOs	<b>DTLLABULK</b>	<b>550.00</b>
12 pack RH locking assembly for MCBs and single pole RCBOs	<b>DTLLARHBULK</b>	<b>550.00</b>
<b>Pole fillers and blanking devices</b>		
12 pack locking blank for MCBs and single pole RCBOs	<b>DTLLB</b>	<b>11.50</b>
Locking blank for DSRCM (add on RCCB), 3 pole MCBs	<b>DTLCM</b>	<b>4.50</b>
Dummy MCB (for total touch protection)	<b>DTLDM</b>	<b>11.60</b>
12 pack pole filler (extended length to suit 63 mm cutout)	<b>DTLPF</b>	<b>11.60</b>
<b>Escutcheons and labels</b>		
Concept premier escutcheon size 1 24 way to suit LockDIN	<b>CPPE5100DTL</b>	<b>200.00</b>
Concept premier escutcheon size 2 48 way to suit LockDIN	<b>CPPE5200DTL</b>	<b>240.00</b>
Concept premier escutcheon size 3 60 way to suit LockDIN	<b>CPPE5300DTL</b>	<b>280.00</b>
Concept premier escutcheon size 4 84 way to suit LockDIN	<b>CPPE5400DTL</b>	<b>320.00</b>
Concept premier escutcheon size 5 96 way to suit LockDIN	<b>CPPE5500DTL</b>	<b>360.00</b>
Concept tough escutcheon size 2 48 way to suit LockDIN	<b>CTES248RDCOLD</b>	<b>550.00</b>
Concept tough escutcheon size 3 96 way to suit LockDIN	<b>CTES396RDCOLD</b>	<b>650.00</b>
Centre escutcheon label 1 - 48	<b>LABLE148DT</b>	<b>22.00</b>
Centre escutcheon label 49 - 96	<b>LABLE4996DT</b>	<b>22.00</b>



## Meter Isolator

### LockDIN™

1

The Lockable Meter Isolator from NHP utilises the captive locking system known as LockDIN™. LockDIN™ has been designed for safe and secure captive locking of Terasaki DIN-T MCBs. When you combine LockDIN™ with a sealable enclosure and Terasaki MCB you have a complete system suitable for meter isolation and supply capacity/ service protection. <sup>1)</sup>

#### DTPC Complete kits include: enclosure, MCB and LockDIN™

No. of poles	Amps	kA	Curve	Cat. No.	Price \$
Enclosure type - DTPC (2 pole)					
1 pole	63 kA	6 A	C	DTPC2LDCB	105.00
			D	DTPC2LDCBV	105.00
Enclosure type - DTPC (4 pole)					
3 pole	63 kA	K kA	C	DTPC4LDCB	240.00
		10 kA	D	DTPC4LDCBV	520.00

#### ILC Complete kits include: enclosure, MCB and LockDIN™

No. of poles	Amps	kA	Curve	Cat. No.	Price \$
<b>Enclosure type - ILC (4 pole)</b>					
1 pole	63 kA	6 A	C	ILC4SLDCB1P	150.00
			D	ILC4SLDCB1PD	155.00
	80-125 A	10 kA	C	ILC4SLDCB__1P <sup>2)</sup>	350.00
			D	ILC4SLDCB__1PD <sup>2)</sup>	425.00
3 pole	63 A	6 kA	C	ILC4SLDCB3P	280.00
		10 kA	D	ILC4SLDCB3PD	290.00
	80-125 A	10 kA	C	ILC4SLDCB__3P <sup>2)</sup>	920.00
			D	ILC4SLDCB__3PD <sup>2)</sup>	980.00



**Notes:** <sup>1)</sup> As the service and installations rules vary from region to region please consult these to check suitability.

<sup>2)</sup> Insert 80, 100 or 125 for required amp rating.



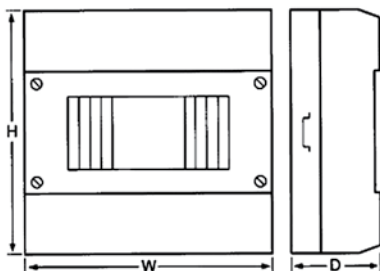
## Meter Isolator

### LockDIN™

#### Enclosures only, to suit meter isolator

To suit	Enclosure type	Cat. No.	Price \$
1 P MCB <63 A	DTPC (2 pole)	<b>DTPC2LD</b>	<b>18.50</b>
1-3 P MCB <63 A	DTPC (4 pole)	<b>DTPC4LD</b>	<b>22.50</b>
1-3 P MCB <63 A	ILC (4 pole)	<b>ILC4SLD</b>	<b>69.00</b>
1-3 P MCB 80-125 A	ILC (4 pole)	<b>ILC4SLD10H</b>	<b>74.00</b>
2 P RCBO 6-40 A	DTPC (2 pole)	<b>DTPC2LDRCBO</b>	<b>19.00</b>

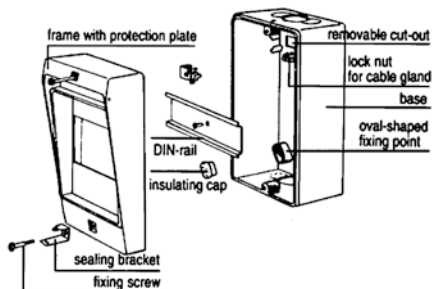
#### DTPC enclosure



#### Dimensions (mm)

No. of poles	Height	Width	Depth
2 pole	139	51	61
4 pole	139	88	61

#### ILC enclosure



#### Dimensions (mm)

No. of poles	Height	Width	Depth
4 pole	175	90	100

## MCB LOCKING SOLUTIONS - LockDIN™

**NHP**

The miniature circuit breaker locking solution  
for Terasaki DIN-T circuit breakers.

POWER PROTECTION



PP-LOCKDIN-MCB-CPB

The first comprehensive system for safe  
and secure locking of DIN miniature circuit  
breakers (MCBs)

- Designed specifically for the mining industry
- Easy to install and retrofit to existing Concept•Premier and Concept•TOUGH panelboards
- Can be used with Terasaki RCBOs
- Accepts 2.5 - 6.5 mm padlocks, hasps and scissor arrangements
- Can only be used with the NHP Terasaki DIN-T range
- Can be used with 1, 2 and 3 pole Terasaki MCBs

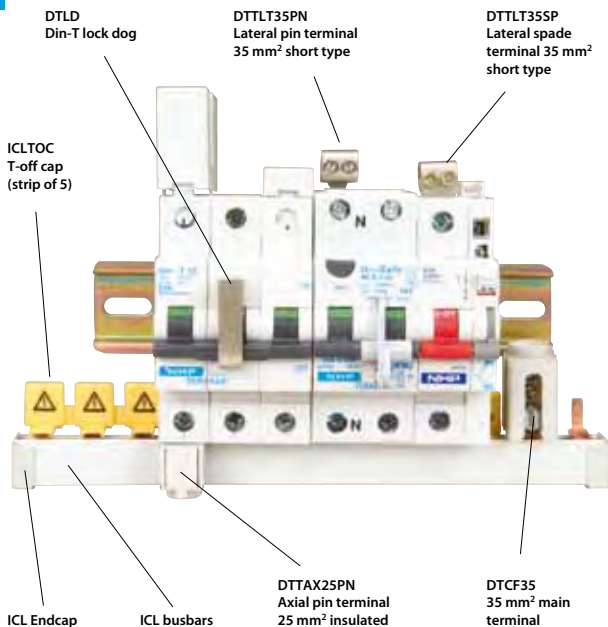


**TERASAKI**  
Innovators in Protection Technology

## Din-T series MCBs

### Accessories

1

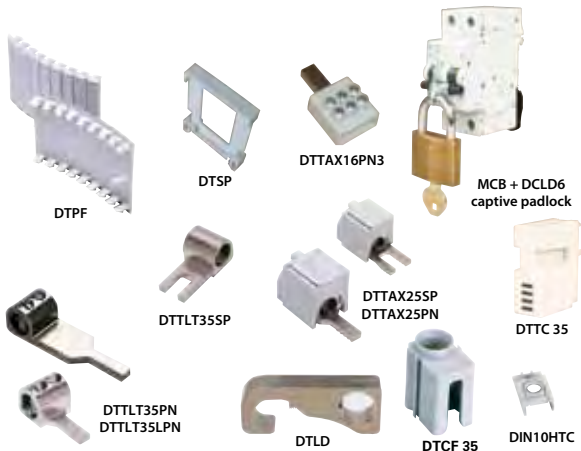


## Din-T series MCBs


### Accessories

1

Description	Cat. No.	Price \$
Lateral pin terminal 35 mm <sup>2</sup> (short type)	DTTLT35PN	10.50
Lateral pin terminal 35 mm <sup>2</sup> (long type)	DTTLT35LPN	10.50
Din-T lock dog (Non-captive)	DTLD	22.20
Din-T lock dog captive (lock DIN) Refer page 1 - 39	-	-
Din-T lock dog captive (1 - 4 pole) <sup>1)</sup>	DCLD6	55.00
Din-T lock dog to suit DINT10H	DTLDH	29.60
Lateral spade terminal 35 mm <sup>2</sup> (short type)	DTTLT35SP	10.50
Axial spade terminal 25 mm <sup>2</sup> (insulated)	DTTAX25SP	10.50
Axial pin terminal 25 mm <sup>2</sup> (insulated)	DTTAX25PN	10.50
Axial pin terminal 50 mm <sup>2</sup> (insulated)	DTTAX50PN	17.50
3 way neutral link suit RCCB	DTTAX16PN3	18.60
35 mm <sup>2</sup> main terminal	DTCF35	17.00
185 mm <sup>2</sup> main terminal	NEB185	85.00
Pole filler (1 strip of 4 poles, 8 x 9 mm segments)	DTPF	4.10
Busbar comb Refer page 1 - 37	-	-
End cap (strip offs) (T-off cap)	ICLTOC	4.40
1/2 module spacer (9 mm wide)	DTSP	4.20
Din-T terminal cover 5 mm	DTTC5	4.50
Din-T terminal cover 35 mm	DTTC35	16.00
Din-T 10H terminal cover	DINT10HTC	5.20



**Notes:** <sup>1)</sup> Suitable for padlock hasp size 4.5 to 6.5 mm.

 Available on indent only.

## Din-T

### Series contactors



- Standard AS/NZS 60947.4.1
- Voltage 240/415 V AC
- Silent operated magnetic drive
- Integrated surge suppression
- Switch position indicator
- DIN rail mount

#### Application

Din-T contactors are electromagnetically controlled switches used to control single or multiphase high power loads while the control itself can be low power. Applications include switching and control of lighting equipment, heating, ventilation, pumps, heat pumps and other equipment.

#### Features

Except for the 20 A version, all Din-T contactors have DC coils, resulting in noise-free silent operation. As all DC coil contactors have an internal diode rectifier bridge they can be operated by both DC and AC power supplies. The built-in varistor protects the coil against an overvoltage of up to 5 kV. The switch position of contacts is visible via a flag indicator on the front of the contactor.

Current Ith	Contact config.	Coil volts	No. of Mods.	Cat. No.	Price \$
20 A	1 NO / 1 NC	240 V AC	1	<b>DTC20-11-240</b>	<b>146.00</b>
20 A	2 N/O	24 V AC	1	<b>DTC20-20-24</b>	<b>146.00</b>
20 A	2 N/O	240 V AC	1	<b>DTC20-20-240</b>	<b>146.00</b>
20 A	2 N/C	240 V AC	1	<b>DTC20-02-240</b>	<b>146.00</b>
24 A	4 N/O	12 V AC/DC	2	<b>DTC24-40-12</b>	<b>169.00</b>
24 A	4 N/O	240 V AC/DC	2	<b>DTC24-40-240</b>	<b>169.00</b>
24 A	4 N/C	240 V AC/DC	2	<b>DTC24-04-240</b>	<b>169.00</b>
24 A	4 N/O	24 V AC/DC	2	<b>i DTC24-40-24</b>	<b>169.00</b>
40 A	4 N/O	24 V AC/DC	3	<b>i DTC40-40-24</b>	<b>300.00</b>
40 A	4 N/O	240 V AC/DC	3	<b>DTC40-40-240</b>	<b>300.00</b>
63 A	4 N/O	24 V AC/DC	3	<b>i DTC63-40-24</b>	<b>415.00</b>
63 A	4 N/O	240 V AC/DC	3	<b>DTC63-40-240</b>	<b>415.00</b>

#### Din-T hour run counter

- DIN rail mounting
- Synchronous motor drive
- 99,999.99 hours
- Permanent visual display non-resettable
- Protection IP 20



No. Modules	Voltage	Cat. No. <sup>1)</sup>	Price \$
2	230 V AC	<b>DTHR</b>	<b>126.00</b>

**Notes:** <sup>1)</sup> Cannot be reset.

**i** Available on indent only.

## Din-T

### Series contactors

1

#### Technical data

Type	DTC20	DTC24	DTC40	DTC63
Rated continuous current I <sub>th</sub>	20 A	24 A	40 A	63 A
<b>AC 1/AC 7a switching of heaters</b>				
Rated operational current I <sub>e</sub> <sup>1)</sup>	20 A	24 A	40 A	63 A
Rated output AC 1      240 V 1ø 415 V 3ø	4 kW	5.3 kW	8.7 kW	13.3 kW
	–	16.0 kW	26.0 kW	–
<b>AC 3/AC 7b switching of motors</b>				
Rated operational current I <sub>e</sub> <sup>1)</sup>	9 A	9 A	22 A	30 A
Rated output AC 3      240 V 1ø 415 V 3ø	1.3 kW	1.3 kW	3.7 kW	5.0 kW
	–	4.0 kW	11.0 kW	15.0 kW
<b>AC 5a switching of electric discharge lamp controls <sup>2)</sup> (uncompensated)</b>				
Rated operational current I <sub>e</sub> <sup>1)</sup>	8 A	10 A	30 A	44 A
<b>AC 5b switching of incandescent lamps <sup>2)</sup></b>				
Rated operational current I <sub>e</sub> <sup>1)</sup>	6 A	7 A	15 A	22 A
<b>Switching on capacity</b>				
cos_ = 0.95 at 220-230 V 1 phase	100 A	–	–	–
cos_ = 0.65 at 380-400 V 3 phase	–	90 A	220 A	300 A
<b>Switching off capacity</b>				
cos_ = 0.95 at 220-230 V 1 phase	80 A	–	–	–
cos_ = 0.65 at 380-400 V 3phase	–	72 A	176 A	240 A
Ohmic loss per contact I <sub>n</sub>	1.0 W	1.5 W	3.0 W	6.0 W
<b>Endurance and mechanical switching</b>				
Max. switching frequency at AC 1/AC 7a	300 h	300 h	300 h	300 h
Max. switching frequency at AC 3/AC 7b	600 h	600 h	600 h	600 h
Mechanical service life	106	106	106	106
Electrical service life at AC 1/AC 7a	150,000	150,000	150,000	150,000
Electrical service life at AC 3/AC 7b	150,000	500,000	170,000	240,000
Terminal capacity max.	1x10 mm <sup>2</sup>	2x4 mm <sup>2</sup>	1x25 mm <sup>2</sup>	2x10 mm <sup>2</sup>
<b>Magnetic control system</b>				
Control voltage range	85...110 % x U <sub>n</sub>			
Rated operating frequency	50 / 60 Hz		DC, 40...450 Hz	
Operating temperature range	-22 °C to +55 °C <sup>3)</sup>			
Max. pull-in coil power loss	8 VA/5 W	4 VA/4 W	5 VA/5 W	65 VA/65 W
Max. holding coil power loss	3.2 VA/1.2 W	4 VA/4 W	5 VA/5 W	4.2 VA/4.2 W
Switching on delay	9...12 ms	<40 ms	<40 ms	<40 ms
Switching off delay	10...12 ms	<40 ms	<40 ms	<40 ms
Terminal capacity max.	1 x 4 mm <sup>2</sup> or 2 x 2.5 mm <sup>2</sup>			

**Notes:** <sup>1)</sup> When parallel switching 2 current paths the rated current I<sub>e</sub> will be multiplied by 1.6.

<sup>2)</sup> For additional lamp switching data refer to NHP.

<sup>3)</sup> If several contactors are mounted side by side in a row fit a half-module spacer (Cat. No. DTSP) between every second contactor.

1

## Din-T

### Impulse switch





















#### Din-T impulse switch

- Standard IEC 60669-2-2
- Visual indication of contact position
- Manual or electrical operation
- Terminal protection IP 20
- 16 A 240 V AC contact rating





#### Function

Impulse switches are electromechanical switches used to control medium power loads while the control itself remains low power. The device switches between 2 stable positions each time a brief pulse is required to switch positions. The device can also be switched manually.


Diagram	Coil Voltage	No. of poles	No. of mods.	In	Cat. No. '1)	Price \$
	12 V AC	1	1	16 A	 DTIS-10-12VAC	63.50
	24 V AC	1	1	16 A	 DTIS-10-24VAC	63.50
	48 V AC	1	1	16 A	 DTIS-10-48VAC	63.50
	240 V AC	1	1	16 A	DTIS-10-240VAC	63.50
	12 V DC	1	1	16 A	 DTIS-10-12VDC	63.50
	24 V DC	1	1	16 A	 DTIS-10-24VDC	63.50
	12 V AC	2	1	16 A	 DTIS-20-12VAC	92.50
	24 V AC	2	1	16 A	 DTIS-20-24VAC	92.50
	48 V AC	2	1	16 A	 DTIS-20-48VAC	92.50
	240 V AC	2	1	16 A	 DTIS-20-240VAC	92.50
	12 V DC	2	1	16 A	 DTIS-20-12VDC	92.50
	24 V DC	2	1	16 A	 DTIS-20-24VDC	92.50
	12 V AC	2	1	16 A	 DTIS-11-12VAC	92.50
	24 V AC	2	1	16 A	 DTIS-11-24VAC	92.50
	48 V AC	2	1	16 A	 DTIS-11-48VAC	92.50
	240 V AC	2	1	16 A	DTIS-11-240VAC	92.50
	12 V DC	2	1	16 A	 DTIS-11-12VDC	92.50
	24 V DC	2	1	16 A	 DTIS-11-24VDC	92.50

#### Add on power contact

Diagram	Coil Voltage	No. of poles	No. of mods.	In	Cat. No. '1)	Price \$
		2	1	16 A	DTIS2NO	80.00
		2	1	16 A	DTIS2CO	80.00

**Notes:** '1) When stacking in rows ensure adequate ventilation, insert spacer (DTSP) every second device.

32 A unit available - refer NHP.

 Available on indent only.

## Sprecher + Schuh CA 8 contactors

1

### Features

- Ideally suited for heating, lighting, hot water and storage heating applications
- Small size, panel or DIN rail mounting
- Contactors can be mechanically interlocked
- Large range of snap-on accessories <sup>1)</sup>
- Conforms to AS/NZS 60947 with world-wide approvals



Contactor CA 8-5

### Maximum current ratings (amps) at 415 volts

Cat. No. <sup>1)</sup>	CA 8-5-10 <sup>2)</sup>			CA 8-9-10 <sup>2)</sup> [CA 8-12-10 <sup>2)</sup> ]			CA 8-9-M40 <sup>2)</sup> <sup>3)</sup>	
Price \$ <sup>4)</sup>	111.00			109.00 [132.00]			138.00	

### Heating loads AC 1

Amps per phase 40 °C (A)	20	34	50	20	34	50	20	64
Amps per phase 60 °C (A)	16	27	40	16	27	40	16	51

### Lighting loads

Tungsten per phase (A)	4	-	-	7	-	-	7	-
Fluorescent 40 °C (A)	18	30	45	18	30	45	18	57
Fluorescent 60 °C (A)	14.5	24	35	14.5	24	35	14.5	45

### Motor loads

Amps 415 volt AC 3	5.3	9.0 [12]			9.0	
kW @ 60 °C	2.6	4.5 [6.1]			4.5	
Width (poles)	2.5	2.5 [2.5]			2.5	

### Emergency lighting test unit

Diagram		Cat. No.	Price \$
Standard switch operated emergency lighting test unit	reset - test	ELTS <sup>5)</sup>	225.00
Key operated emergency lighting test unit	reset - test	ELTK <sup>5)</sup>	240.00



ELTS



ELTK

- Notes:**
- <sup>1)</sup> For further information refer to Part A Section 3 Price List Catalogue.
  - <sup>2)</sup> Supplied with 1 N/O auxiliary contact. For 1 N/C auxiliary contact specify 01 instead of 10 when ordering.
  - <sup>3)</sup> M40 denotes 4 pole contactor.
  - <sup>4)</sup> Price is for standard coil voltage.
  - <sup>5)</sup> Cat. No. ELTS and ELTK use Price Schedule 'A4'



## DIN rail mounted surge diverters - Electrical network

The Cirprotec range of DIN rail mounted surge diverters are specially designed to provide complete and effective protection against surges, protecting equipment and property connected to the low-voltage network. The Cirprotec DIN rail mountable surge diverter range consists of the pluggable PSC and PSM Series.

### Features:

- Compact size
- Status indication (via flag)
- DIN rail mounting
- Thermal disconnection
- Remote indication (via volt free contact)



PSC series



PSM series

### PSC Series

The PSC pluggable range consists of Type 1+2 (according to IEC) surge protective devices (lightning arrester) (10/350  $\mu$ s) and surge protector (8/20  $\mu$ s) with low  $U_p$  (protection of downstream equipments) for single-phase and three-phase electrical power networks.

These units are ideal for protection of service entrances and distribution panels in areas exposed to lightning activity or externally generated heavy transients.

No. of phases	No. of poles	$I_{max}$	Connection	$I_N$	$U_c$	$U_p$	Cat. No.	Price \$
1	1	12.5 kA	65 kA L-N	20 kA	275 V	< 1.3 kV	CPTPSC1-12/230 IR	255.00
1	1	25 kA	65 kA N-PE	25 kA	255 V	< 1.5 kV	CPTPSC1-25N <sup>1)</sup>	255.00
1	1	25 kA	100 kA L-N	25 kA	275 V	< 1.3 kV	CPTPSC1-25/230 IR	410.00
1	1	50 kA	100 kA N-PE	50 kA	275 V	< 1.5 kV	CPTPSC1-50N <sup>1)</sup>	410.00
1	2	12.5 kA	65 kA L+N-PE	20 kA	275 V	< 1.3 kV	CPTPSC2-12/230 IR	520.00
3	4	12.5 kA	65 kA L+L+L+N-PE	20 kA	440 V	< 1.3 kV	CPTPSC4-12/400 IR	1020.00

### PSM Series

The PSM pluggable range consists of Type 2 (according to IEC) surge protective devices designed for protection against transient overvoltages in single-phase and three-phase electrical power networks.

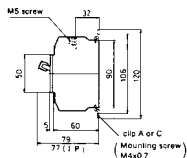
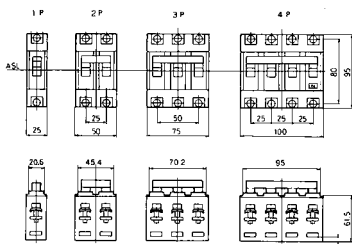
These units are ideal for protection of distribution and branch panels, electronic equipment etc.

No. of phases	No. of poles	$I_{max}$	Connection	$I_N$	$U_c$	$U_p$	Cat. No.	Price \$
1	1	20 kA	L-N	10 kA	275 V	< 1.4 kV	CPTPSM1-20/230 IR	105.00
1	1	20 kA	N-PE	10 kA	255 V	< 1.5 kV	CPTPSM1-20N	105.00
1	1	40 kA	L-N	20 kA	275 V	< 1.3 kV	CPTPSM1-40/230 IR	150.00
1	1	40 kA	N-PE	20 kA	275 V	< 1.5 kV	CPTPSM1-40N	150.00
1	2	20 kA	L+N-PE	10 kA	275 V	< 1.4 kV	CPTPSM2-20/230 IR	260.00
1	2	40 kA	L+N-PE	20 kA	275 V	< 1.3 kV	CPTPSM2-40/230 IR	310.00
3	4	20 kA	L+L+L+N-PE	10 kA	440 V	< 1.4 kV	CPTPSM4-20/400 IR	490.00
3	4	40 kA	L+L+L+N-PE	20 kA	440 V	< 1.3 kV	CPTPSM4-40/400 IR	650.00

**Notes:** <sup>1)</sup>  $U_p$  listed above is between L - N. The  $U_p$  between N - PE is < 1.5 kV.

## Safe-T (6-63 A) MCBs

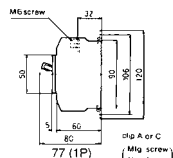
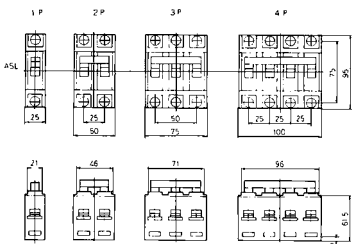
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Preparation of conductor



## Safe-T (80-100 A) MCBs

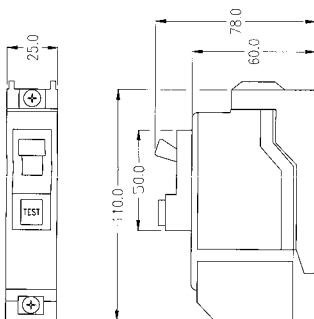


preparation of conductor

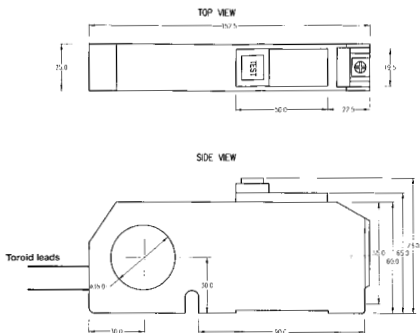




## Safe-T (SRCB) RCBO

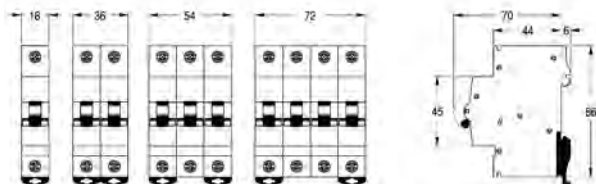


## Safe-T (ELR) earth leakage relay

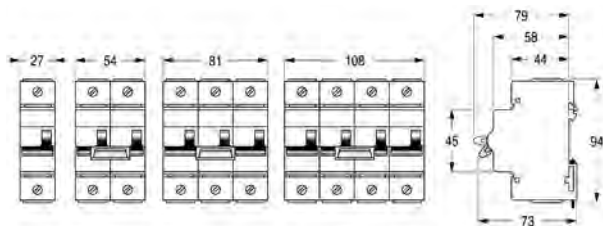


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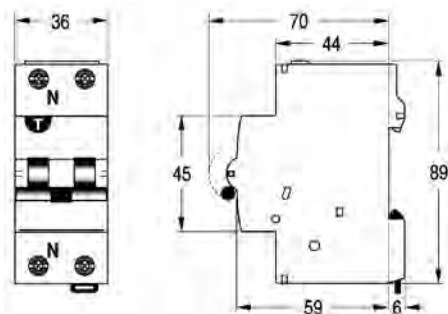
## Din-T 6, 10, 15 / Din-T DC - MCBs



## Din-T 10H - MCBs



## Din-Safe - 2 P RCBO



## Din-Safe – Add-on earth leakage module

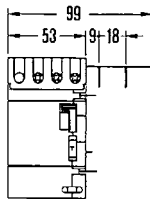
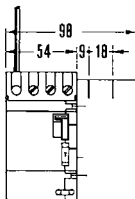
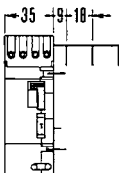
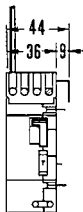
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1 P + N (32 & 63 A)

3 P + N (32 A)

3 P + N (63 A)

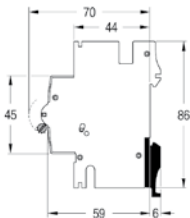
3 P (63 A)



## Din-T shunt trip

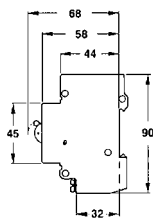
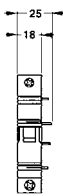
To suit:

Din-T 6, 10, 15, Din-T DC



To suit:

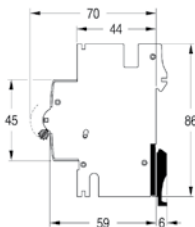
Din-T 10H



## Din-T undervoltage trip

To suit:

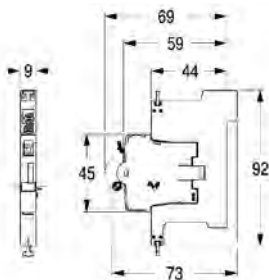
Din-T 6, 10, 15, Din-T DC (not Din-T10H)



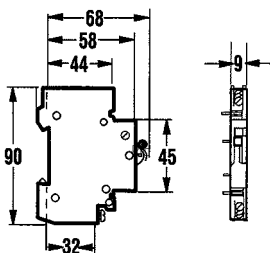
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## Din-Safe – Add-on earth leakage module

**Din-T 6, 10, 15, Din-T DC**

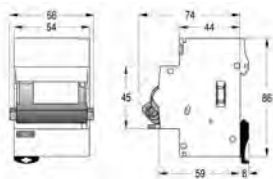


**Din-T 10H**

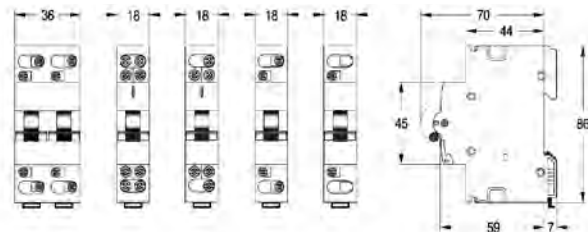


**Din-T - motor operator**

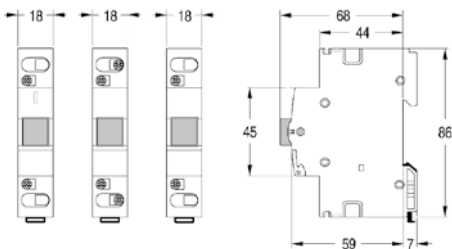
**Din-T - panelboard switch**



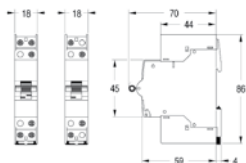
## Din-T - changeover switch



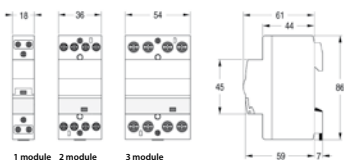
Din-T - pushbutton



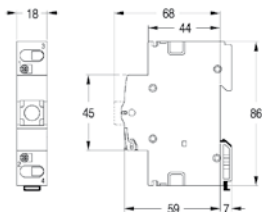
Din-T - pilot light



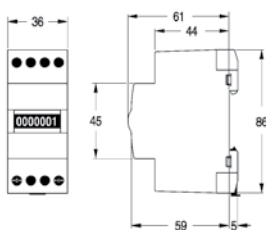
Din-T - contactor



Din-T - impulse switch



Din-T - hour run counter





## ENCLOSED ISOLATOR - LockDIN™

**NHP**

Comprehensive system for safe and secure locking of DIN miniature circuit breakers (MCBs).

POWER PROTECTION



PP-TERASAKI-LOCKDIN-CP8

- Meter isolator
- Ideal as a supply capacity / service protection device
- Securely locks off Terasaki Din-T MCBs
- Suits 1 P and 3 P MCBs up to 125 A
- Accepts 3 - 6 mm padlock
- Lead sealable enclosure

**TERASAKI**  
Innovators in Protection Technology

## Time switches and DIN rail mounted instruments

1

### Grasslin time switches

Talento range - Analogue, 24 hour and 7 day	1 - 58
Talento range - Digital, 24 hour, 7 day and yearly	1 - 58

### IME DIN rail mounted instruments

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Analogue meters (AC & DC)	1 - 60 to 1 - 61
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Energy meters	1 - 64 to 1 - 65
CTs (solid and split core)	1 - 66

### SATEC

Branch circuit metering	1 - 67
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## Time switches

## Talento range

1

- Digital & Analogue
- 24 hr, 7 day and yearly programming
- 17.5 mm wide and standard DIN housing
- 1, 2 and 4 channel flexibility
- Economical synchronous operation and quartz precision with reserve
- Manual override
- Pulse switching capability (TAL 471,472 PLUS)
- Energy saving ASTRO function (TAL 791 PLUS)



TAL111MINI



TAL372 PLUS



TAL891

## Specifications

Supply voltage: 220 - 240 V 50 Hz  
 Contact rating: 16 A / 240 V AC 1  
 (resistive load)

\* Other voltages available, contact NHP.

## Analogue 24 hr &amp; 7 day - 16 A rating (resistive load)

Programme	Reserve	Min. switch time	Contact	Cat. No.	Price \$
24 hr	–	30 min	1 N/O	TAL111MINI	98.50
24 hr	–	30 min	1 C/O	TAL111	101.00
24 hr	50 hr	30 min	1 N/O	TAL211MINI	146.00
24 hr	150 hr	30 min	1 C/O	TAL211	193.00
7 day	–	3 hr	1 C/O	TAL171	143.00
7 day	150 hr	3 hr	1 C/O	TAL271	205.00

## Digital 24 hr, 7 day &amp; yearly - 16 A rating (resistive load)

Programme	Reserve	Min. switch time	No. of memory locations	Contact	Cat. No.	Price \$
24hr/7 days	3 yrs	1 min	50	1 C/O	TAL371MP240VAC	140.00
24hr/7 days	3 yrs	1 min	50	1 C/O	TAL371P240VAC	205.00
24hr/7 days	3 yrs	1 min	50	2 C/O	TAL372P240VAC	315.00
24hr/7 days	3 yrs	1 min	50	1 C/O	TAL471P240VAC	250.00
24hr/7 days	3 yrs	1 min	50	1 C/O + 1 N/O	TAL472P240VAC	375.00
Astro	3 yrs	Daylight Switch		1 C/O	TAL791P240VAC	410.00
Yearly	3 yrs	1 sec	400	1 C/O	TAL891	730.00
Yearly	3 yrs	1 sec	400	2 C/O	TAL892	860.00
Yearly	3 yrs	1 sec	400	4 C/O	TAL894	1100.00

## DIN rail instruments

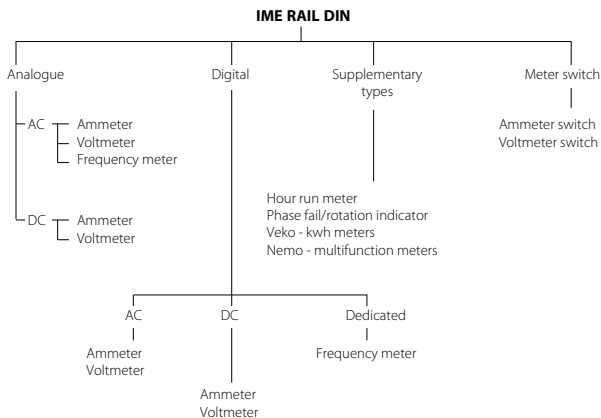
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IME DIN instruments are an exciting concept in instrumentation giving a choice of analogue or digital display in a DIN rail mounted housing.

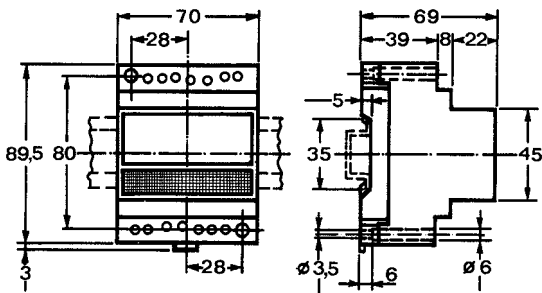
The IME concept of DIN rail mounted equipment occupies four poles of DIN (e.g.; same space as four Din-T circuit breakers), and offers an economical and convenient system for applications such as metering in starters and distribution centres.

DIN rail equipment is simple to install and has IP 50 front protection.

### IME RAIL DIN family





### Overall dimensions (mm)






## 1

## Analogue meters (AC)

## Direct connect ammeters D4E-A AC - 2 times overscale

Range	Cat. No.	Price \$
0-1 A	 D4E-AAC 1A	104.00
0-2.5 A	 D4E-AAC 2.5A	104.00
0-5 A	D4E-AAC 5A	104.00
0-10 A	D4E-AAC 10A	104.00
0-15 A	D4E-AAC 15A	104.00
0-20 A	D4E-AAC 20A	104.00
0-25 A	D4E-AAC 25A	104.00
0-30 A	D4E-AAC 30A	104.00
0-40 A	D4E-AAC 40A	104.00
0-50 A	D4E-AAC 50A	104.00
0-60 A	D4E-AAC 60A	104.00



## CT operated ammeters D4E-ACT

Range	Cat. No.	Price \$
5 A 5 times overscale	 D4E-ACT 5A 5X <sup>1)</sup>	104.00
5 A 2 times overscale	D4E-ACT 5A 2X <sup>1)</sup>	104.00
1 A 5 times overscale	 D4E-ACT 1A 5X <sup>1)</sup>	104.00
1 A 2 times overscale	 D4E-ACT 1A 2X <sup>1)</sup>	104.00

## Maximum demand ammeter D4TN

Range	Cat. No.	Price \$
5 A CT 5 times overscale	D4TN 5A...A	164.00

## Direct connect voltmeters D4E-V AC

Range	Cat. No.	Price \$
0-100 V	 D4E-VAC 100V	113.00
0-150 V	 D4E-VAC 150V	113.00
0-300 V	D4E-VAC 300V	113.00
0-500 V	D4E-VAC 500V	113.00

## Frequency meter D4FI


Range	Cat. No.	Price \$
45-55 Hz 240 V	D4FI 240 V	230.00



AC Voltmeter  
Cat. No. D4E-VAC 300V

**Notes:** Standard scales - C.T. operated meters comprise the following scale ranges and their decade multiples - 10/20 A, 12/24 A, 15/30 A, 20/40 A, 25/50 A, 30/60 A, 40/80 A, 50/100 A, 60/120 A, 75/150 A, 80/160 A, up to 4 kA / 8 kA.

<sup>1)</sup> Include range scale to suit chosen current transformer ratio. e.g. A 2 times overscale ammeter operating from an 800/5 A CT will have a Cat. No. D4E-ACT 5A 2X 800A.

 Available on indent only.

## Analogue meters (DC)

1

**Direct connect ammeters D4M-ADC**

	Cat. No.	Price \$
0-1 mA to 0-8 mA	D4M-ADC M1 <sup>1)</sup>	154.00
0-10 mA to 0-800 mA	D4M-ADC M2 <sup>1)</sup>	154.00
1, 5, 10, 15, 25, 40 A	D4M-ADC <sup>1)</sup>	184.00

**Shunt connected ammeters D4M-ADC**

	Cat. No.	Price \$
0-10 A to 0-1000 A 50 mV	D4M-ADC 5 <sup>1)</sup>	184.00
0-20 A to 0-1000 A 75 mV	 D4M-ADC 7 <sup>1)</sup>	184.00

**Direct connect DC voltmeters D4M-VDC**

	Cat. No.	Price \$
0-0.5 V to 0-600 V	D4M-VDC V <sup>1)</sup>	160.00

**Direct connect AC (rectified) voltmeters D4M-VAC**

	Cat. No.	Price \$
0-10 V to 0-600 V	D4M-VAC V <sup>1)</sup>	160.00

**Notes:** Standard scales - Moving coil meters comprise the following scale ranges and their decade multiples - 0 - 10, 12, 15, 20, 25, 30, 40, 50, 60, 70, 75, 80, 90.

<sup>1)</sup> Please include range required at the end of the Cat. No.

e.g. A 0-150 V DC voltmeter in a DIN rail housing will have a Cat. No. D4M-V DC V/150.


<sup>2)</sup> Price does not include a shunt (shunts ordered separately).

A wide selection of 50 mV or 75 mV shunts available in stock with current ranges from 10 amps to 12000 amps, refer NHP Part B price list catalogue.

For meter scale requiring non-standard captions, please add input and scale when ordering.

e.g. A 0-10 mA ammeter in a DIN rail housing, scaled 0-500 RPM will have

Cat. No. D4M-ADC M2 / input 0-10 mA scale 0-500RPM.

 Available on indent only.



## Digital meters

1

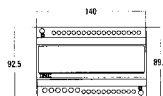
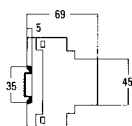
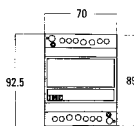
## Frequency meter

Range	Input	Connection	Auxiliary	Cat. No.	Price \$
10-100 Hz	100-500 V	Direct	240 V AC	<b>DGMS07F1</b>	<b>415.00</b>

## Hour run meter

Range	Supply	Cat. No.	Price \$
5 digital + 2 decimal	110 V AC	<b>D2.0 - 110 V</b>	<b>132.00</b>
5 digital + 2 decimal	240 V AC	<b>D2.0 - 240 V</b>	<b>132.00</b>

## DIN Rail meter dimensions (mm)



Cat. No. D4/DGM meters  
4 module

Cat. No. D8 Meters  
8 module

## Phase fail/rotation indicator

Range	Cat. No.	Price \$
100-440 V 50-60 Hz	<b>D4SE</b>	<b>290.00</b>

Available on indent only.

## Digital meters

1

### Ammeters

AC ammeter	Connection	Display range	Auxiliary	Cat. No.	Price \$
0-1 A	CT	Selectable <sup>1)</sup>	240 V AC	DGMG07C2	340.00
0-5 A	CT	Selectable <sup>1)</sup>	240 V AC	DGMG07C1	340.00
0-10 A	Direct	9.99 A	240 V AC	DGMA07A3	330.00
0-20 A	Direct	20.0 A	240 V AC	DGMA07A4	330.00

DC ammeter	Connection	Display range	Auxiliary	Cat. No.	Price \$
0-50/75 mV	Shunt	Selectable <sup>1)</sup>	240 V AC	DGMM07L5	370.00
0-50/75 mV	Shunt	Selectable <sup>1)</sup>	20-150 V DC	DGMM0HL5	330.00

### Voltmeters

AC ammeter	Connection	Display range	Auxiliary	Cat. No.	Price \$
0-500 V	Direct	Selectable <sup>1)</sup>	240 V AC	DGMG07C1	340.00
0-500 V	Direct	Selectable <sup>1)</sup>	20-150 V DC	DGMG0HC1	330.00
0-1000 V	VT	999 V	240 V AC	i DGMD07D1	330.00

DC ammeter	Connection	Display range	Auxiliary	Cat. No.	Price \$
0-100/500	Direct	99.9/500 V	240 V AC	DGMN07N6	330.00
0-100/500	Direct	99.9/500 V	20-150 V DC	DGMN0HN6	330.00

### Sprecher + Schuh distribution panel control and metering switches

Type	Cat. No. <sup>2)</sup>	Price \$
12 A ammeter switch for CTs	i LA 2-12-8751/Q	180.00
12 A voltmeter switch phase-phase	LA 2-12-8271/QA	148.00
12 A voltmeter switch phase-phase/neutral	i LA 2-12-8251/QA	159.00
12 A 1 pole on/off switch	LA 2-12-1751/Q	96.50
12 A 3 pole on/off switch	LA 2-12-1753/Q	111.00
12 A 1 pole c/o switch	LA 2-12-3251/Q	124.00

**Notes:** <sup>1)</sup> Selectable 38 ranges - 5-8000 A or 0-500 V refer chart G, Section 9 - Part B Price List Catalogue.

<sup>2)</sup> Sprecher + Schuh switches – Price Schedule 'A3'

i Available on indent only.



## IME Veko and Conto energy meters

1

Cat. No.	CE201 75A2	CE201 85A2	CE4DT 14A2	CE4DT 14A6	CE4DT 06A2	CE4DT 06A4
Price \$	385.00	380.00	540.00	620.00	580.00	710.00
Display type	6 Digit LCD		8 digit LCD – 6 mm high			
Power system	1ø	1ø	1ø & 3ø		3ø	
Measurement parameters						
Active energy kWh reading	✓	✓	✓	✓	✓	✓
Active energy MWh reading	-	-	✓	✓	✓	✓
Reactive energy kvarh reading	-	-	✓	✓	✓	✓
Reactive energy Mvarh reading	-	-	✓	✓	✓	✓
Partial active energy	-	-	✓	✓	✓	✓
Partial reactive energy	-	-	✓	✓	✓	✓
Current display 3 digit	✓	✓	-	-	-	-
Voltage display 4 digit	✓	✓	-	-	-	-
Power demand	✓	✓	✓	✓	✓	✓
Maximum demand power	-	-	✓	✓	✓	✓
Outputs						
Active energy pulse	✓	✓	✓	✓	✓	-
Reactive energy pulse	-	-	✓	✓	✓	-
RS 485 comms, Modbus/Jbus	-	-	-	✓	-	✓
Accuracy Class						
Accuracy class 1 (active energy)	✓	-	-	-	-	-
Connection details						
Direct current input up to 32 A	✓	-	-	-	-	-
Direct current input up to 63 A	-	✓	✓	✓	-	✓
Input current 5 A CT	-	-	✓	✓	-	-
Input current 1 A CT	-	-	✓	✓	-	-
Single phase 240 V AC	✓	✓	✓	✓	✓	✓
3 Phase, 415 V AC 3 wire	-	-	✓	✓	✓	✓
3 Phase, 415 V AC 4 wire	-	-	✓	✓	✓	✓
Isolated Input	-	-	✓	✓	✓	✓
Current transformers	-	-	1, 2 or 3			
Dimensions in mm (H x W x D)	89 x 35 x 60		89 x 71 x 66			
DIN modules	2	2	4			
Auxiliary power supply	Self-supplied from measurement					

**Notes:** Comprehensive range of IME TAI & TAS series of current transformers are available in catalogue Part B on pages 9 - 30 to 9 - 33.  
Please see catalogue Part B, page 9 - 13 for panel mount kit.



## Carlo Gavazzi energy meters

1

### Compact DIN Energy Analyser: EM24DIN

The EM24DIN is a compact Energy Analyser for single and 3-phase systems. This compact meter is capable of measuring not only the traditional active and reactive energies but also gas, hot-water, cold-water, and remote heating consumptions.

Description	Energy meter EM24DIN
Housing (H x W x D)	90 mm x 71 mm x 65 mm (4 DIN modules)
Class accuracy	Class 1 (kWh)
System type	Single, 2 or 3 phase (Dependant on balanced/unbalanced)
Voltage input	120/208 V AC, 400 V AC
Current input	1 A, 5 A via CT's or Direct connect up to 65 A (dependant on model)
Measurements	V, A, Admdmax, Var, VA, VAdmd, VAdmdmax, W, Wdmd, Wdmdmax, Hz, kWh, kVarh, PF, Phase-sequence, h
Inputs	3 Pulse inputs for gas, hot water and cold water
Outputs	2 Pulse, 2 digital or RS485 (dependant on model)
Power supply	Self supplied, 18 to 60 V AC/DC, 230 V AC (dependant on model)
Protection Degree	IP 40

Description	Cat. No.	Price \$
Compact panel energy analyser direct connect + pulse	<b>EM24-DIN-AV93-XR2X</b>	<b>520.00</b>
Compact panel energy analyser CT connect + pulse	<b>EM24-DIN-AV53-DR2X</b>	<b>560.00</b>
Compact panel energy analyser direct connect + RS485 + Gas/water inputs	<b>EM24-DIN-AV93-XISP</b>	<b>690.00</b>
Compact panel energy analyser CT connect + RS485 + Gas/water inputs	<b>EM24-DIN-AV53-DISP</b>	<b>670.00</b>

Energy, gas  
and water in  
one meter



EM24DIN

**Notes:** Compatible with Powersoft energy management software, see catalogue Part B section 9  
 Available on indent only.

## Current transformers for cables

1

- Housing, self-extinguishing thermoplastic
- nHighest system voltage, 720 V RMS
- Test voltage, 3 kV RMS 50 Hz for 1 min.
- Frequency of operation, 40-60 Hz
- Insulation Class, B (130 °C)
- Short circuit thermal current (Ith) 60-100 times rated primary current for 1 sec.
- Rated dynamic current 2.5 times Ith
- Rated continuous thermal current 120 % of rated primary current

### Accuracy class

### Ratio:

CL 0.5  
VA

CL 1  
VA

CL 3  
VA

Primary / Secondary current - 5 A or 1 A

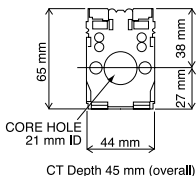
### TAI BB - Cable Ø 21 mm max.

			Cat. No. <sup>1)</sup>	5 A Price \$	1 A Price \$
2.5	3.5	4	TAI BB 120...	50.00	-
3	4	5	TAI BB 150...	50.00	-
4	5.5	6	TAI BB 200...	50.00	-
5	6	7	TAI BB 250...	50.00	-

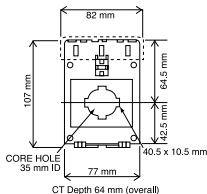
### TAI 400 - Cable Ø 35 mm, Busbar 40 x 10 mm max.

8	12	15	TAI 400 400...	66.50	88.50
---	----	----	----------------	-------	-------

### TAI BB



### TAI 400



### Split core current transformers

- Allows installation without disconnecting cables or busbar circuits
- Suitable for existing installation, retrofit applications
- Supplied with mounting screws and terminal covers
- 2 sets of secondary terminal (CTD range)



Model	A	Class 1	Class 3	Window size (mm)	Cat. No.	Price \$
CTD-5S	125	1.5	1.5	26 x 32	CTD5S1255AXXX	197.00
	150	1.5	2.5		CTD5S1505AXXX	210.00
	200	1.5	5		CTD5S2005AXXX	210.00
	250	1.5	5		CTD5S2505AXXX	215.00
	400	5	10		CTD5S4005AXXX	235.00

**Notes:** <sup>1)</sup> Add primary and secondary current + 5A or 1A to suffix to complete Cat. No.  
More current ratio and physical sizes available on request, contact NHP.  
Class 0.5 available upon request

## Energy meter

### Branch Feeder Monitor - Multi-circuit energy meter

1

#### Features and benefits

- Multi-point power, energy and demand data logging.
- Data storage
- Real Time Clock (TRC) and Flash memory for data and event logger.
- TOU (Time Of Use): the TOU function stores energy consumption data according to the programmed time schedule.
- Daily energy tariff profile and maximum demands programmable interval for load profile.
- Logging for any type of parameters, for all profiles.
- Local LCD display providing up to 36 channels of consumption readings
- Cost effective, space-saving compact design for easy installation into existing electric panelboards.
- Automatic installation verification: The BFM performs automatic synchronisation between voltages and currents per phase.
- Standard Communication Platforms
  - Protocols:
    - Modbus RTU
    - Modbus TCP/IP
  - Ports:
    - Standard: RS485 port
    - Optional: Ethernet TCP/IP, dial-up modem, RS232, additional RS485/422 port
- High accuracy 0.5S
- Input
  - Current inputs: 36 per device.
  - Measured currents, per phase: direct 100 or 400 Amp or up to 5000 A primary in conjunction with conventional 5 A or 1A secondary CT.
  - Voltage input: wide range 88 – 138 V AC (115) or 176 – 265 V AC (400/230).
  - Self power supply: 3-phase + N fed from the measured voltages.
- Alarm configuration: Over/ under voltage, over current, over kW, over kVA, over/ under frequency.
- Three year warranty.

Description	Cat. No. <sup>1)</sup>	Price \$
Branch Feeder Monitor - Ethernet + RS485	<b>BFM13650HZETHD</b>	<b>5060.00</b>
BFM 100 A CT 12 mm 2.5 m cable	<b>CT126</b>	<b>76.00</b>
BFM 100 A CT 23 mm 2.5 m cable	<b>CT236</b>	<b>87.50</b>
BFM 100 A split CT 16 mm 2.5 m	<b>CTSC6</b>	<b>220.00</b>
BFM 400 A CT 26 mm 2.5 m cable	<b>CT4A6</b>	<b>210.00</b>



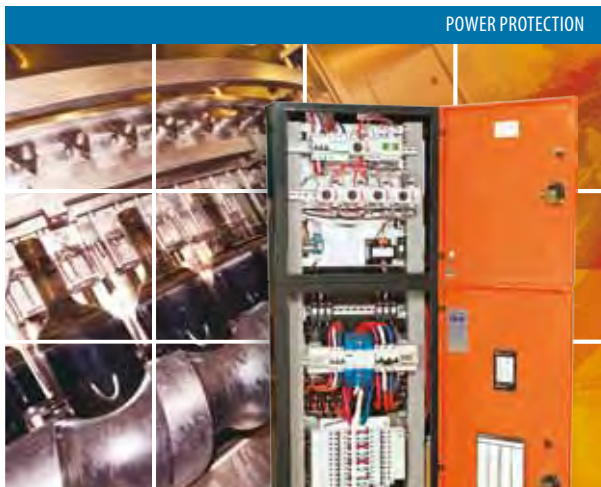
CT4A6

**Notes:** <sup>1)</sup> Contact NHP for details and pricing on chassis designs with multi-circuit monitoring.

## CONCEPT MODULAR DISTRIBUTION PANELBOARDS



NHP Concept Plus and Premier panelboards can be assembled into a large variety of differing combinations, which make possible unique panelboards.



PP-TERASAKI-CONCEPT PANEL-CPB

- Modular box size
- Accessory boxes available
- Top or side mount standard boxes together
- For Din-T, Safe-T MCBs or MCCBs up to 250 A
- Enclosure colour options
- Stainless steel option (CONCEPT PREMIER)
- Double width plinths and rain-hood available
- Modular panelboard assembly is made to order from stocked as standard components

**CONCEPT • PLUS**

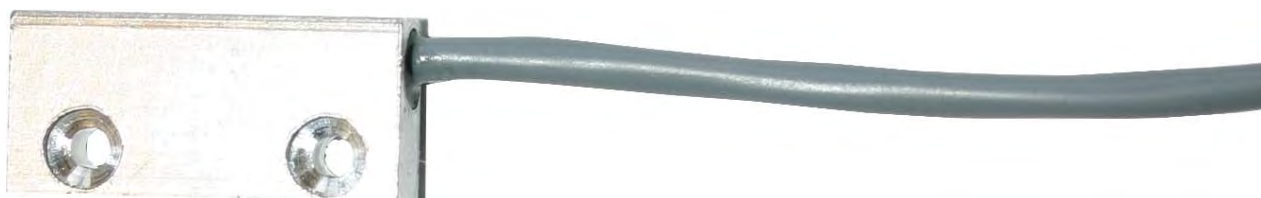
**CONCEPT • PREMIER**



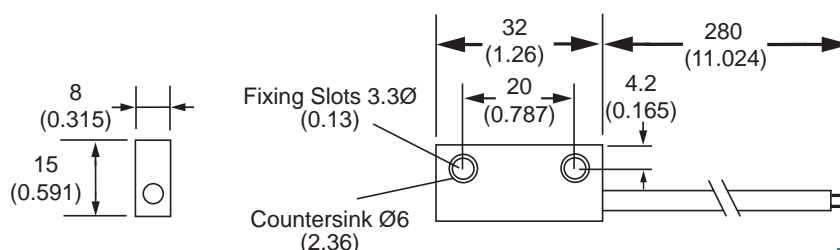


**Proximity Switch - Reed Switch based - Rectangular - Normally Open Contacts**  
**Part Number : CTC012      Suggested Magnet: CTCM**  
**Product Data Sheet**

**PICTURE**



**DIMENSIONS**



Drawings not to scale  
 All dimensions in mm nominal

✓RoHS Compliant

**SPECIFICATION**

Contact Form / Style	Normally Open
Switching Voltage	200 Vac
Switching Current	0.5 A
Switching Capacity (Resistive)	10 VA
Switching Distance	10.0 mm Minimum
Operating Temperature - Continuous	-20°C +85°C
Operating Temperature - Intermittent	-25°C +85°C
Storage temperature	-25°C +85°C
Case Material	Aluminium
Cable	2 x 0.14mm <sup>2</sup> PVC Covered

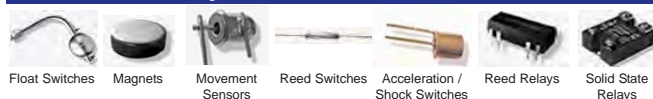
**Applications Include**

- Position and limit sensing.
- Linear actuators.
- Security system switch.
- Door Switch.

**Options**

- Custom cable lengths, strip lengths, cable types, terminations.
- Higher Switching Voltage available.
- If you do not see what you need, just ask, as there is a strong possibility we can do it !

**Did you know we also sell?**



**Rev. No.**

1

**Revision Note**

First Issue

**Date**

19-07-06

**Signature**

NG

FORM AE043 ISS.2



As part of the company policy of continued product improvement, specifications may change without notice. Our sales office will be pleased to help you with the latest information on this product range and the details of our full design and manufacturing service. All products are supplied to our standard conditions of sale unless otherwise agreed in writing.

Phone : +44 (0)1255 862236

www.assembletech.co.uk

Fax: +44 (0)1255 862014

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## Parameter Setting

40080447-2741492

52742855

Purchase order number

3004809762-10 / Endress+Hauser Flowtec AG

Order N°/Manufacturer

91WA1-AA3C10ACA1AA

Order code

F301A220000

Serial N°

PROSONIC FLOW 91 W

Transmitter/Sensor

DN100...4000

Nominal diameter

-

Tag N°

The below parameters are set according to your order.  
Please refer to the Operating Manual for any parameters not mentioned.

Communication type

Device software

Device revision

HART

V1.01.00

Dev.1/DD.2 [ID 62 (hex)]

### Operation

Language

English

### Units

Unit volume flow

Unit volume

Unit temperature

Unit velocity

Unit viscosity

Unit of length

m<sup>3</sup>/hr

l

°C

m/s

mm<sup>2</sup>/s

mm

### Current output 1

Current span

Value 20 mA

Time constant

Failsafe mode

4-20 mA HART NAMUR

45 m<sup>3</sup>/hr

1 s

Maximum value

19/03/2012

Date

Endress+Hauser Flowtec (India) Pvt. Ltd.  
M-171 - M-176, Waluj MIDC  
Aurangabad - 431 136, India

## Parameter Setting

40080447-2741492

### Pulse output 1

Operation mode  
Pulse value  
Pulse width  
Output signal

Volume flow  
5 l  
100 ms  
passive/negative

### Pipe data

Pipe material  
Pipe diameter  
Wall thickness

Stainless steel  
88.90 mm  
3.20 mm

### Liner

Liner material

Liner none

### Liquid data

Liquid  
Temperature  
Sound velocity liquid

Water  
20 °C  
1487 m/s

### Sensor data

Sensor type  
Sensor configuration  
Position sensor  
Sensor distance

W-CL-1F-L-C  
2 traverses  
C 22  
201.8 mm

19/03/2012

Date

Endress+Hauser Flowtec (India) Pvt. Ltd.  
M-171 - M-176, Waluj MIDC  
Aurangabad - 431 136, India





Level



Pressure



Flow



Temperature



Liquid  
Analysis



Registration



Systems  
Components



Services

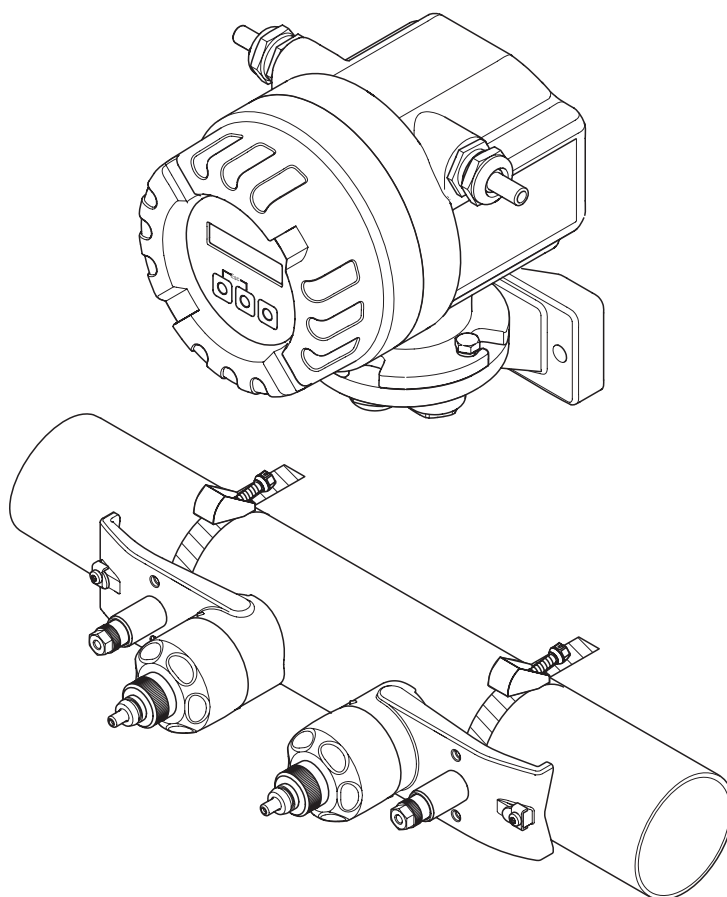


Solutions

## Operating Instructions

# Proline Prosonic Flow 91

## Ultrasonic Flow Measuring System



BA100D/06/en/02.10  
71109049

Valid as of software version  
V 1.01.XX (electronics board)

**Endress+Hauser**   
People for Process Automation

## Brief operating instructions

The brief operating instructions are aimed at helping you commission your measuring device quickly and easily:

<b>Safety instructions</b>	→ 5
First familiarize yourself with the safety instructions to be able to carry out the following work steps quickly and easily. Here, you can find information on:	
<ul style="list-style-type: none"> <li>■ The designated use of the measuring device</li> <li>■ The operational safety</li> <li>■ The safety symbols and conventions used in the document</li> </ul>	
▼	
<b>Connecting the transmitter</b>	→ 22
Install the sensors using the transmitter software. Therefore connect the transmitter first to the power supply.	
▼	
<b>Display and operating elements</b>	→ 28
A brief overview of the different display and operating elements to allow you to start quickly.	
▼	
<b>Installing the sensors</b>	→ 10
Installing the flowrate measuring sensors Prosonic Flow W (clamp-on)	
▼	
<b>Sensor Setup</b>	→ 40
Measuring devices with a local display: Use the "Sensor Setup" (→ 40) to determine the data required for sensor installation such as sensor distance, wire length, pipe materials, sound velocity in liquids, etc.	
<ul style="list-style-type: none"> <li>■ The system provides you with the sensor distance for the W "clamp-on" versions as distance data. For the W sensors, you also receive the data in the form of a letter for sensor 1 and in the form of a number for sensor 2. You can thus easily position the sensors with the aid of the mounting rail.</li> </ul>	
Measuring devices without a local display: No Sensor Setup is available for devices without a local display. The sensor installation procedure for such devices is explained on.	
Connection of the sensor/transmitter connecting cable → 22	
▼	
<b>Customer-specific configuration</b>	→ 43
Complex measurement tasks require the configuration of additional functions which you can individually select, set and adapt to your process conditions using the function matrix. There are two options:	
<ul style="list-style-type: none"> <li>■ Setting parameters via the configuration program "FieldCare"</li> <li>■ Setting parameters via the local display (optional)</li> </ul>	
All functions are described in detail, as is the function matrix itself → 67.	



### Note!

Always start troubleshooting with the checklist on → 49 if faults occur after commissioning or during operation. This takes you directly (via various queries) to the cause of the problem and the appropriate remedial measures.

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# 1 Safety instructions

## 1.1 Designated use

The measuring device described in these Operating Instructions is to be used only for measuring the flow of liquids in closed pipes, e.g.:

- Ultra clean water with low conductivity
- Water, wastewater, etc.

As well as measuring the volume flow, the measuring system also always measures the sound velocity of the fluid. In this way, you can distinguish between different fluids or monitor the fluid quality.

Resulting from incorrect use or from use other than that designated the operational safety of the measuring devices can be suspended. The manufacturer accepts no liability for damages resulting from this.

## 1.2 Installation, commissioning, operation

Note the following points:


- Installation, connection to the electricity supply, commissioning and maintenance of the device must be carried out by trained, qualified specialists authorized to perform such work by the facility's owner-operator. The specialist must have read and understood these Operating Instructions and must follow the instructions they contain.
- The device must be operated by persons authorized and trained by the plant operator. Strict compliance with the instructions in these Operating Instructions is mandatory.
- Endress+Hauser is willing to assist in clarifying the chemical resistance properties of parts wetted by special fluids, including fluids used for cleaning. However, small changes in temperature, concentration or the degree of contamination in the process can result in changes to the chemical resistance properties. For this reason, Endress+Hauser does not accept any responsibility with regard to the corrosion resistance of materials wetted by fluids in a specific application. The user is responsible for the choice of wetted materials with regard to their in-process resistance to corrosion.
- If welding work is performed on the piping system, do not ground the welding appliance through the flowmeter.
- The installer must ensure that the measuring system is correctly wired in accordance with the wiring diagrams. The transmitter must be grounded, except in cases where special protective measures have been taken (e.g. galvanically isolated power supply SELV or PELV).
- Always note the regulations applicable in your country to the operation, maintenance and repair of electrical devices. Special instructions relating to the device can be found in the relevant sections of the documentation.

## 1.3 Operational safety

Note the following points:

- The measuring device meets the general safety requirements according to EN 61010-1 and the EMC requirements according to IEC/EN 61326 in addition to the NAMUR recommendations NE 21, NE 43 and NE 53.
- When hot fluid passes through the measuring tube, the surface temperature of the housing increases. In the case of the sensor, in particular, users should expect temperatures that can be close to the fluid temperature. If the temperature of the fluid is high, implement sufficient measures to prevent burning or scalding.
- The manufacturer reserves the right to modify technical data without prior notice. Your Endress+Hauser distributor will supply you with current information and updates to these Operating Instructions.

## 1.4 Return

- Do not return a measuring device if you are not absolutely certain that all traces of hazardous substances have been removed, e.g. substances which have penetrated crevices or diffused through plastic.
- Costs incurred for waste disposal and injury (burns, etc.) due to inadequate cleaning will be charged to the owner-operator.
- Please note the measures on →  59

## 1.5 Notes on safety conventions and icons

The devices are designed and tested to meet state-of-the-art safety requirements, and have left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations in accordance with EN 61010 -1 "Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures". The devices can, however, be a source of danger if used incorrectly or for other than the designated use. For this reason, always pay particular attention to the safety instructions indicated in these Operating Instructions by the following icons:



**Warning!**

"Warning" indicates an action or procedure which, if not performed correctly, can result in personal injury or a safety hazard. Comply strictly with the instructions and proceed with care.



**Caution!**

"Caution" indicates an action or procedure which, if not performed correctly, can result in incorrect operation or destruction of the device. Comply strictly with the instructions.



**Note!**

"Note" indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

## 2 Identification

### 2.1 Device designation

The flowmeter system consists of the following components:

- Transmitter Prosonic Flow 91
- Prosonic Flow W sensor

#### 2.1.1 Nameplate of the transmitter

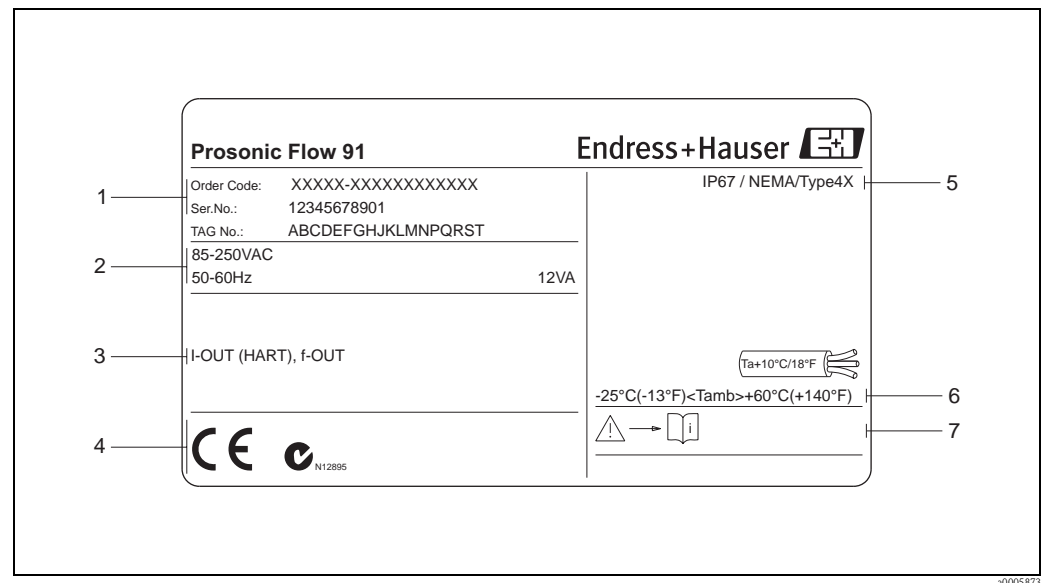


Fig. 1: Nameplate specifications for the "Prosonic Flow 91" transmitter (example)

- 1 Order code /serial number: see the specifications on the order confirmation for the meanings of the individual letters and digits
- 2 Power supply, frequency, power consumption
- 3 Outputs available:  
I-OUT (HART): with current output (HART)  
PULSE-OUT: with pulse/status output
- 4 Reserved for additional information on device version (approvals, certificates)
- 5 Permitted ambient temperature range
- 6 Degree of protection
- 7 Please comply with the Operating Instructions

2.1.2 Nameplate of the sensor

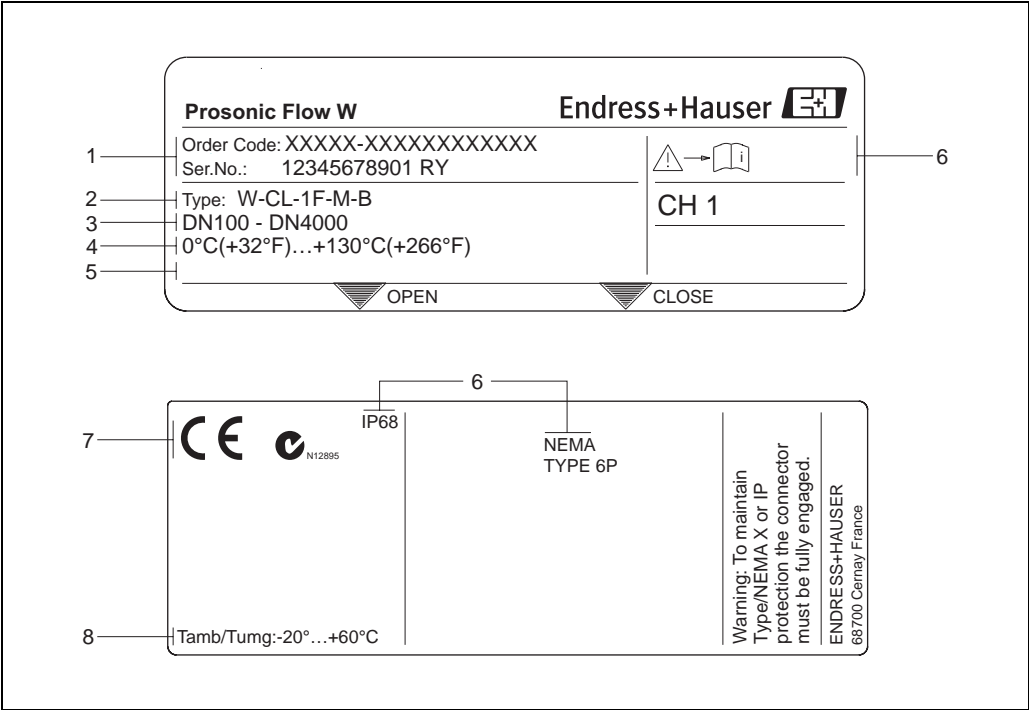


Fig. 2: Nameplate specifications for the "Prosonic Flow W" sensors (example)

- 1 Ordering code/serial number: See the specifications on the order confirmation for the meanings of the individual letters and digits.
- 2 Sensor type
- 3 Nominal diameter
- 4 Fluid temperature range
- 5 Reserved for information on special products
- 6 Please comply with the Operating Instructions
- 7 Reserved for additional information on device version (approvals, certificates)
- 8 Degree of protection
- 9 Permitted ambient temperature range

2.1.3 Nameplate of the connections

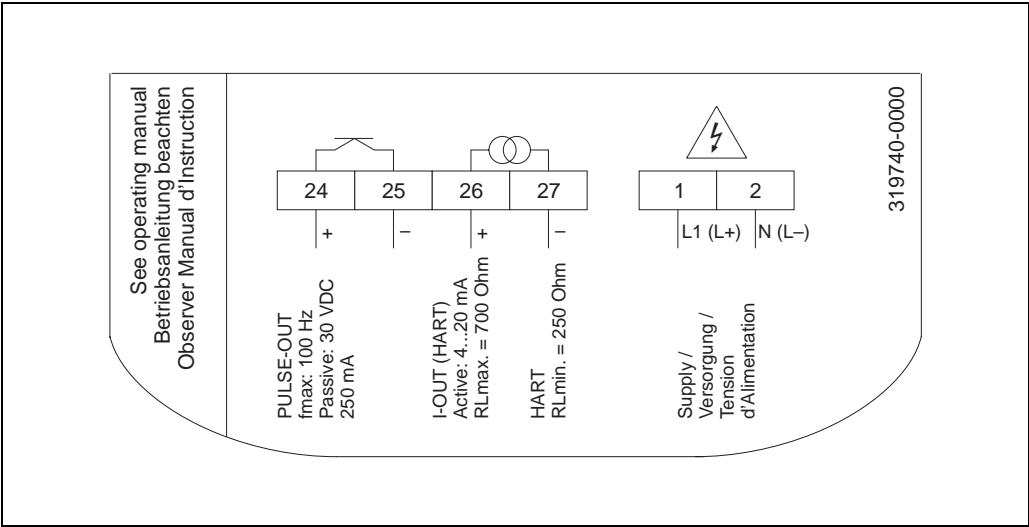


Fig. 3: Nameplate specifications for the transmitter (example)



## 2.2 Certificates and approvals

The devices are designed and tested to meet state-of-the-art safety requirements in accordance with sound engineering practice. They have left the factory in a condition in which they are safe to operate. The devices comply with the standards EN 61010 -1 "Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures" and with the EMC requirements of IEC/EN 61326.

The measuring system described in these Operating Instructions therefore complies with the legal requirements of the EU Directives. Endress+Hauser confirms this by affixing the CE mark to it and by issuing the CE Declaration of Conformity.

The measuring system is in conformity with the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

## 2.3 Registered trademarks

HART®

Registered trademark of HART Communication Foundation, Austin, USA

HistoROM™, T-DAT™, FieldCare®, Field Xpert™, Fieldcheck®, Applicator®

Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, CH

## 3 Installation

### 3.1 Incoming acceptance, transport and storage

#### 3.1.1 Incoming acceptance

On receipt of the goods, check the following points:


- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

#### 3.1.2 Transport

The devices must be transported in the container supplied when transporting them to the measuring point.

#### 3.1.3 Storage

Note the following points:

- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation).  
The original packaging provides optimum protection.
- The storage temperature corresponds to the ambient temperature range of the transmitter, the measuring sensors and the corresponding sensor cables →  64.
- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.

## 3.2 Installation conditions

### 3.2.1 Installation dimensions

The dimensions and lengths of the sensor and transmitter can be found in the "Technical Information" document for the device in question. This can be downloaded as a PDF file from [www.endress.com](http://www.endress.com). A list of the "Technical Information" documents available is provided in Section "Documentation" on → 66.

### 3.2.2 Mounting location

Correct measuring is possible only if the pipe is full. **Avoid** the following mounting locations:

- Do not install at the highest point in the run. Risk of air accumulating!
- Do not install directly upstream from an open pipe outlet in a down pipe.

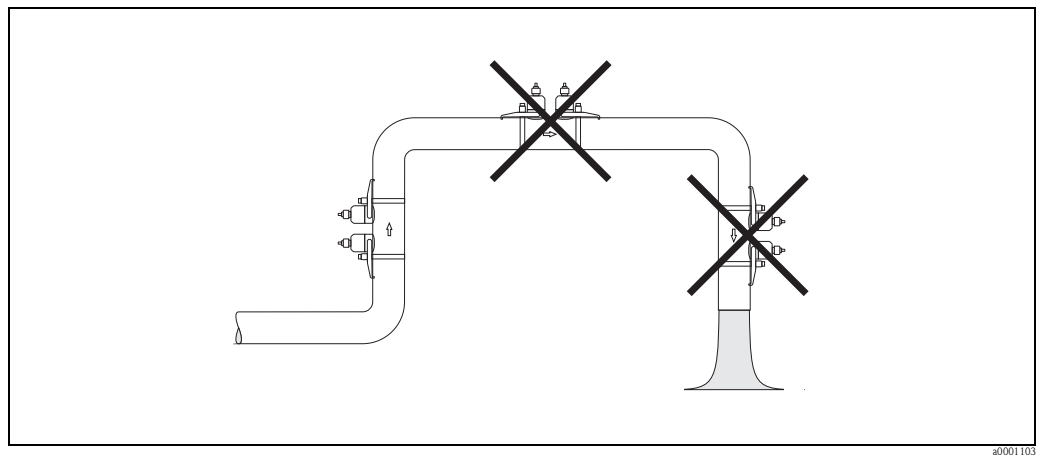


Fig. 4: Mounting location

### Down pipes

Notwithstanding the above, the installation proposal below permits installation in an open down pipe. Pipe restrictions or the use of an orifice plate with a smaller cross-section than the nominal diameter prevent the pipe from running empty while measurement is in progress.

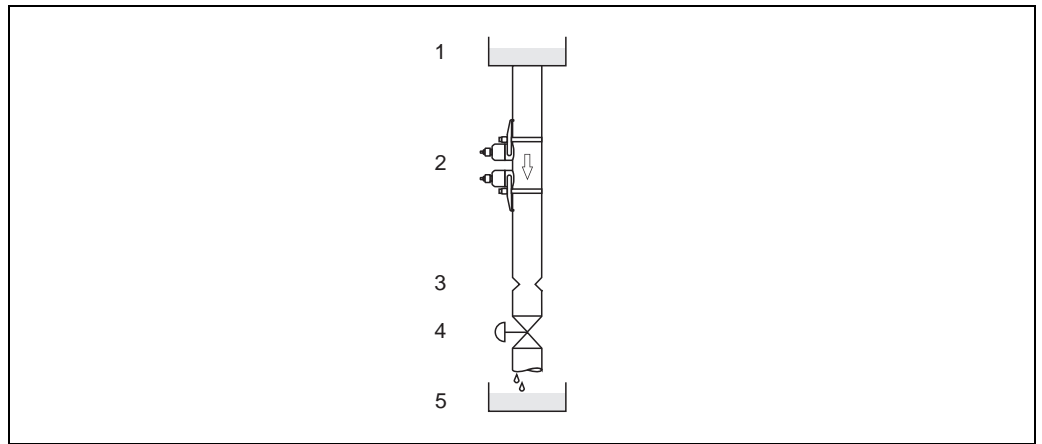


Fig. 5: Installation in a down pipe

1 = Supply tank, 2 = Measuring sensors, 3 = Orifice plate, pipe restriction, 4 = Valve, 5 = Filling tank

### 3.2.3 Orientation

#### Vertical orientation

Recommended orientation with upward direction of flow (View A). Entrained solids sink down. Gases rise away from the measuring sensor when fluid is not flowing. The piping can be completely drained and protected against buildup.

#### Horizontal orientation

In the recommended installation range in a horizontal installation position (View B), gas and air accumulation at the pipe cover and problematic buildups at the bottom of the pipe have a minor influence on the measurement.

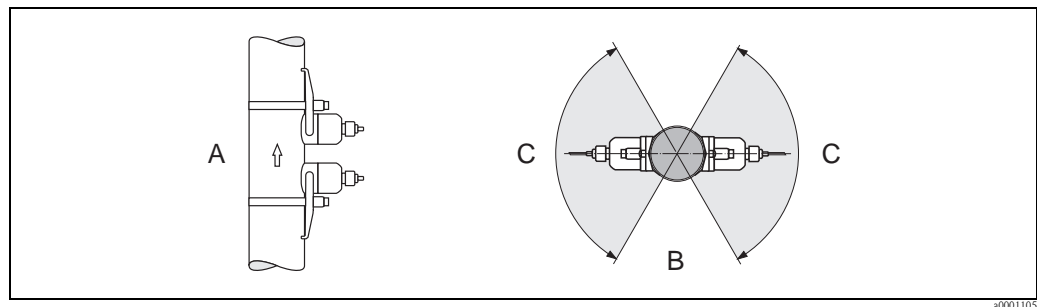


Fig. 6: Orientation

- A Vertical
- B Horizontal
- C Recommended installation range max. 120°

### 3.2.4 Inlet and outlet runs

If possible, install the sensor well clear of assemblies such as valves, T-pieces, elbows, etc. If several flow obstructions are installed, the longest inlet or outlet run must be considered. Compliance with the following requirements for the inlet and outlet runs is recommended to ensure measuring accuracy.

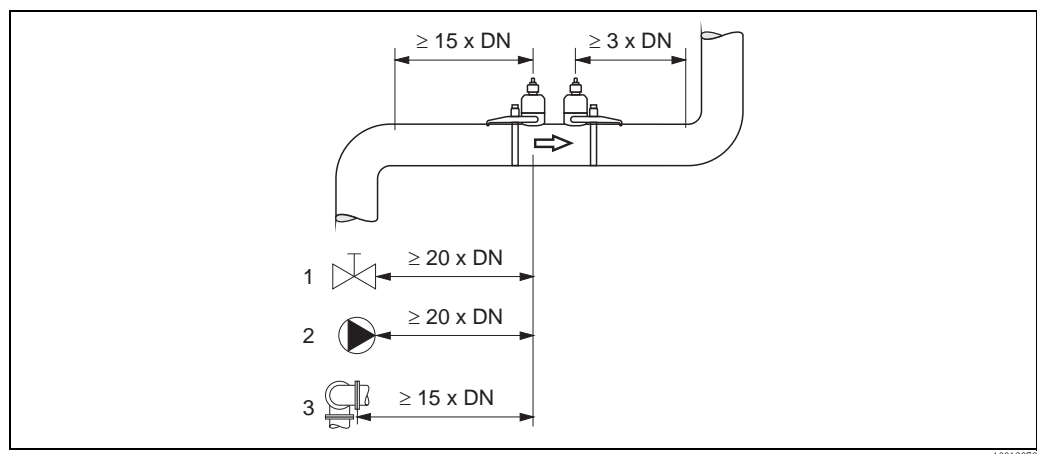


Fig. 7: Inlet and outlet runs (top view)

- 1 Valve (2/3 open)
- 2 Pump
- 3 Double bends

### 3.2.5 Sensor selection and arrangement

The sensors can be arranged differently:

- Mounting arrangement for measurement via one traverse: the sensors are located on opposite sides of the pipe.
- Mounting arrangement for measurement via two traverses: the sensors are located on the same side of the pipe.

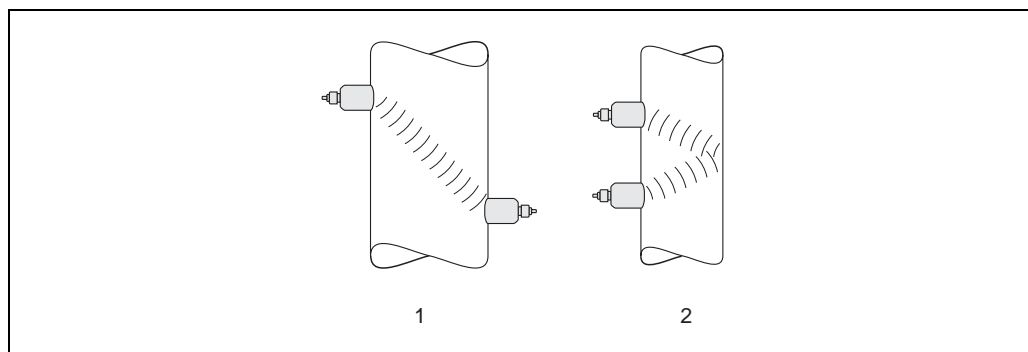


Fig. 8: Sensor mounting arrangement (top view)

- 1 Mounting arrangement for measurement via one traverse  
 2 Mounting arrangement for measurement via two traverses

### Recommendations

Due to their design and properties, the Prosonic Flow sensors are particularly suited to certain nominal diameter ranges and pipe wall thicknesses. For this reason, various sensor types are offered for these different applications for Prosonic Flow W.

Recommendations for sensor type and installation can be found in the following table.

Sensor type	Nominal diameter	Sensor Frequency	Sensor ID	Type of mounting <sup>1)</sup>
Prosonic Flow W	DN 50 to 60 (2" to 2½")	2 MHz	W-CL-2F*	2 (or 1) traverses <sup>2)</sup>
	DN 80 (3")	2 MHz	W-CL-2F*	2 traverses
	DN 100 to 300 (4" to 12")	2 MHz (or 1 MHz)	W-CL-1F* W-CL-2F*	2 traverses <sup>3)</sup>
	DN 300 to 600 (12" to 24")	1 MHz (or 2 MHz)	W-CL-1F* W-CL-2F*	2 traverses <sup>3)</sup>
	DN 650 to 4000 (26" to 160")	1 MHz (or 0.5 MHz)	W-CL-1F* W-CL-05F*	1 traverses <sup>3)</sup>

<sup>1)</sup> The installation of clamp-on sensors is principally recommended in the 2 traverse type installation. This type of installation allows the easiest and most comfortable type of mounting and means that a system can also be mounted even if the pipe can only be accessed from one side. However, in certain applications a 1 traverse installation may be preferred.

These include:

- Certain plastic pipes with wall thickness >4 mm
- Pipes made of composite materials such as GRP
- Lined pipes
- Applications with fluids with high acoustic damping

<sup>2)</sup> If pipe nominal diameter is small (DN 60, 2½" and smaller), the sensor spacing with Prosonic Flow W can be too small for a two traverse installation. In the case, the 1 traverse type of installation must be used.

<sup>3)</sup> 0.5 MHz sensors are also recommended for applications with composite material pipes such as GRP and may be recommended for certain lined pipes, pipes with wall thickness >10 mm, or applications with media with high acoustic damping. In addition, for these applications we principally recommend mounting the W sensors in a 1 traverse configuration.

### 3.3 Installation instructions



Note!

Sensor orientation shown in the following sketches is for visual purpose only.  
Please apply the recommended sensor orientation → 12

#### 3.3.1 Installing tensioning bands

##### For sensor W - DN 50 to 200 (2" to 8")

Outer diameter: 62.7 to 220 mm (2.5" to 8.7")

1. Push one of the supplied threaded bolts on the tensioning band.
2. Run the tensioning band around the pipe without twisting it and push the end through the tensioning band lock (make sure that the screw is pushed up).
3. By hand, make the tensioning band as tight as possible.
4. Push the screw down and tighten the tensioning band with a screwdriver so that it cannot slip.
5. If so desired, shorten the tensioning band to the desired length.



Caution!

Risk of injury. When shortening the tensioning band, try to avoid sharp edges.

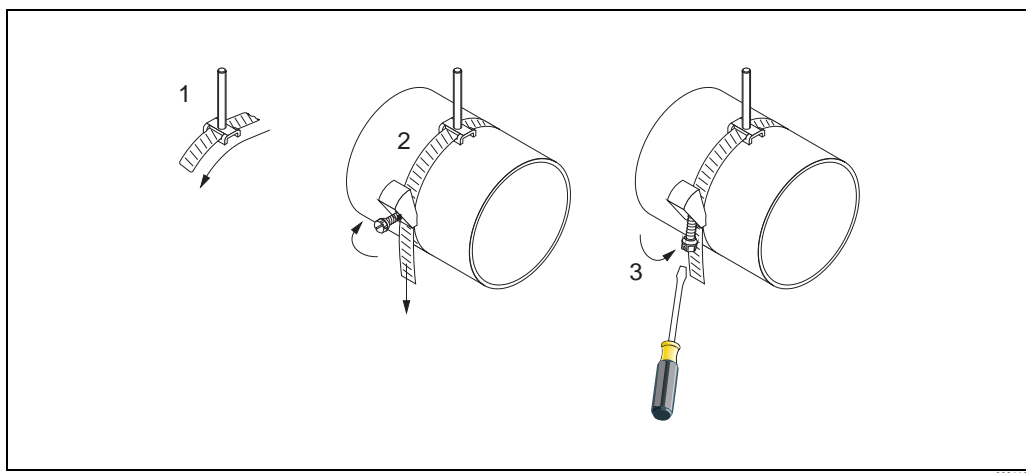


Fig. 9: Tensioning band installation for DN 50 to 200 (2" to 8")

##### For sensor W - DN 250 to 4000 (10" to 160")

Outer diameter: 200 to 4020 mm (8" to 158")

The following steps relate to → 10.

1. Measure the pipe circumference.  
Shorten the tensioning band to the pipe circumference + 10 cm (3.94 in).
- Caution!**  
Risk of injury. When shortening the tensioning band, try to avoid sharp edges.
2. Loop the tensioning band through one of the centering plates supplied with the threaded bolt (1).
  3. Insert both ends of the tensioning bands down into the openings in the tensioning band lock (2). Bend back the ends of the tensioning bands.

4. Interlock both halves of the lock (3). Make sure that there is sufficient space for the tensioning band to be tightened with the locking screw.
5. Tighten the tensioning band using a screwdriver (4).

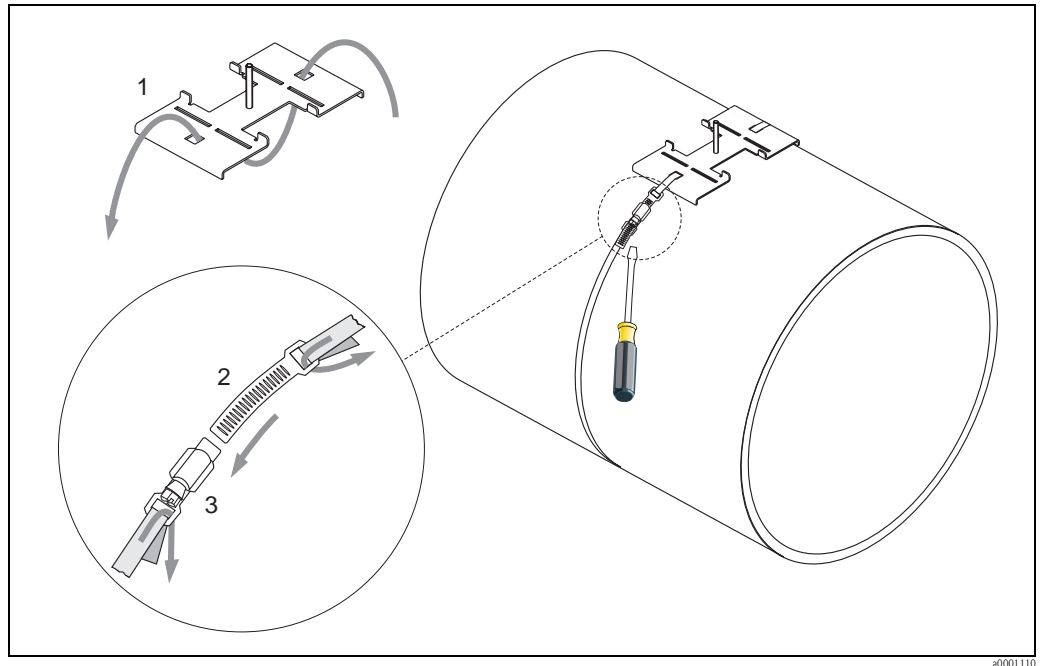


Fig. 10: Tensioning band installation for DN 250 to 4000 (10" to 160")

### 3.3.2 Installation for measurement via one traverse

#### Prerequisites

- The installation distances (sensor distance and wire length) are known → 12.
- The strapping bands are already mounted → 14.

#### Material

The following material is needed for mounting:

- Two strapping bands incl. mounting bolts and centering plates where necessary (already mounted → 14)
- Two measuring wires, each with a cable lug and a fixer to position the strapping bands
- Two sensor holders
- Coupling fluid for an acoustic connection between the sensor and pipe
- Two sensors incl. connecting cables.

#### Procedure

1. Prepare the two measuring wires:
  - Arrange the cable lugs and fixer such that the distance they are apart corresponds to the wire length (SL).
  - Screw the fixer onto the measuring wire.

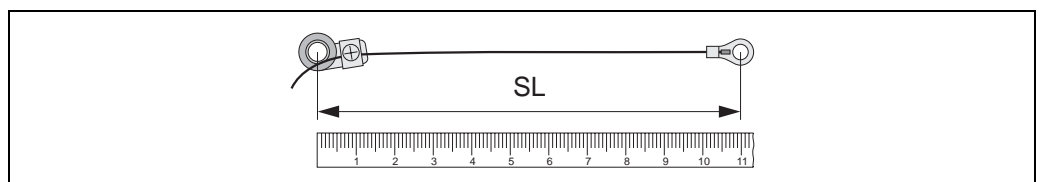


Fig. 11: Fixer (a) and cable lugs (b) at a distance that corresponds to the wire length (SL)

2. With the first measuring wire:
  - Fit the fixer over the mounting bolt of the strapping band that is already securely mounted.
  - Run the measuring wire **clockwise** around the pipe.
  - Fit the cable lug over the mounting bolt of the strapping band that can still be moved.
3. With the second measuring wire:
  - Fit the cable lug over the mounting bolt of the strapping band that is already securely mounted.
  - Run the measuring wire **counterclockwise** around the pipe.
  - Fit the fixer over the mounting bolt of the strapping band that can still be moved.
4. Take the still movable strapping band, incl. the mounting bolt, and move it until both measuring wires are evenly tensioned and tighten the strapping band so that it cannot slip.

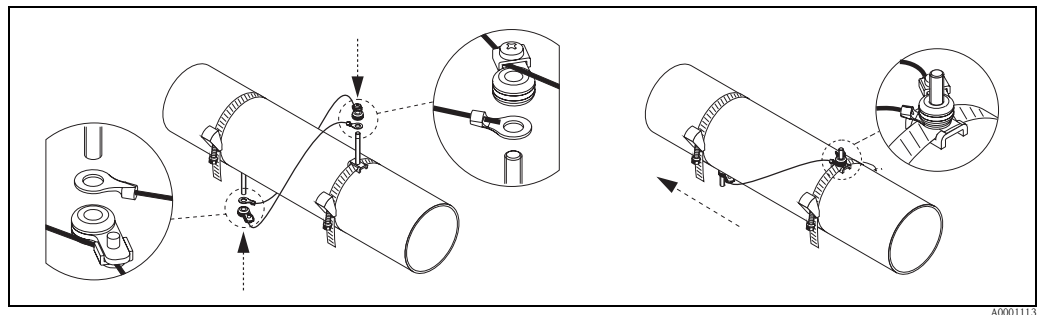


Fig. 12: Positioning the strapping bands (steps 2 to 4)

5. Loosen the screws of the fixers on the measuring wires and remove the measuring wires from the mounting bolt.
6. Fit the sensor holders over the individual mounting bolts and tighten securely with the retaining nut.

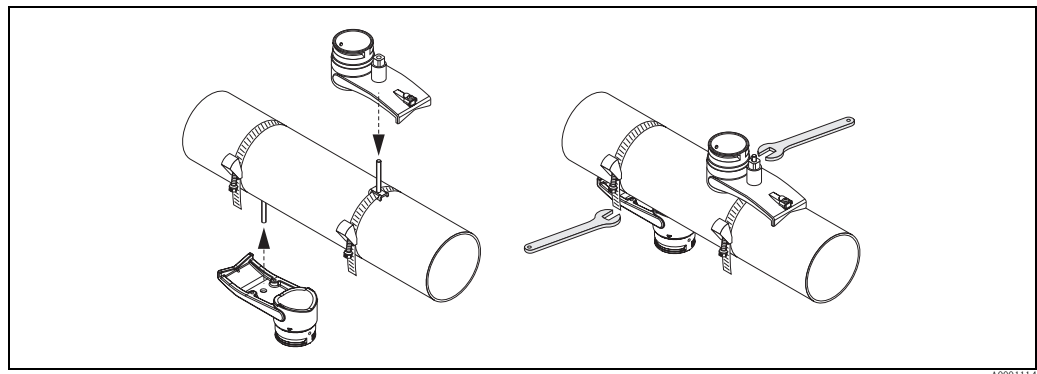


Fig. 13: Mounting the sensor holders



7. Coat the contact surfaces of the sensors with an even layer of coupling fluid approx. 1 mm thick, going from the groove through the center to the opposite edge.

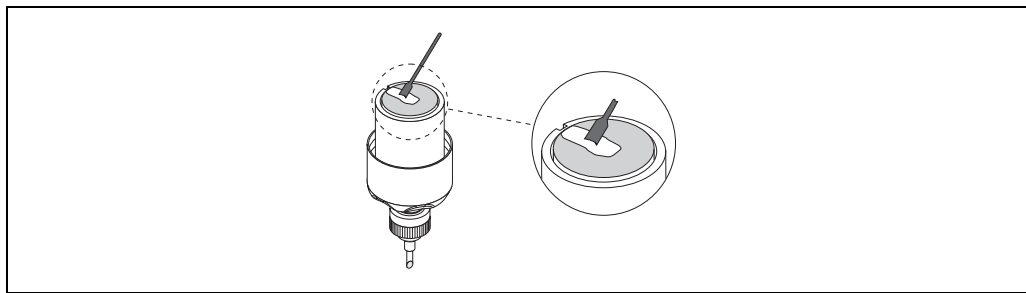


Fig. 14: Coating the contact surfaces of the sensor with coupling fluid

8. Insert the sensor into the sensor holder.
9. Fit the sensor cover on the sensor holder and turn until:
  - The sensor cover engages with a click
  - The arrows (▲ / ▼ "close") are pointing towards one another.
10. Screw the connecting cable into the individual sensor.

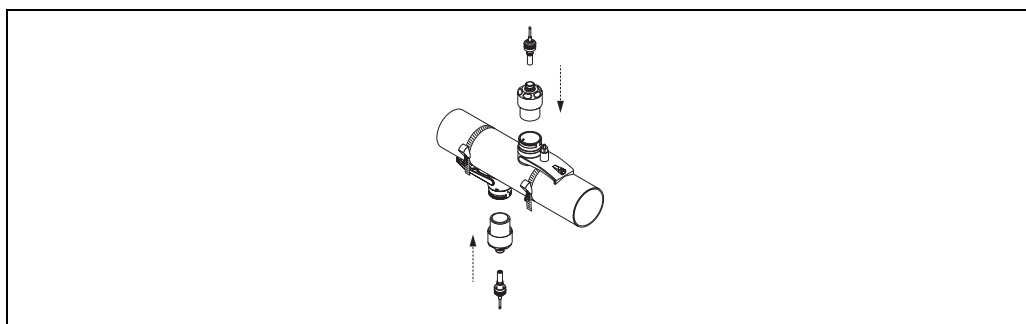


Fig. 15: Mounting the sensor and connecting the connecting cable

This completes the mounting process. The sensors can now be connected to the transmitter via the connecting cables → 22.

### 3.3.3 Installation for measurement via two traverses

#### Prerequisites

- The installation distances (sensor distance and wire length) are known → 12.
- The strapping bands are already mounted → 14.

#### Material

The following material is needed for mounting:

- Two strapping bands incl. mounting bolts and centering plates where necessary (already mounted → 14)
- A mounting rail to position the strapping bands
- Two mounting rail holders
- Two sensor holders
- Coupling fluid for an acoustic connection between the sensor and pipe
- Two sensors incl. connecting cables.

#### Mounting rail and POSITION SENSOR installation distance

The mounting rail has two rows with bores. The bores in one of the rows are indicated by letters and the bores in the other row are indicated by numerical values. The value determined for the POSITION SENSOR installation distance is made up of a letter and a numerical value.

The bores that are identified by the specific letter and numerical value are used to position the strapping bands.

#### Procedure

1. Position the strapping bands with the aid of the mounting rail.
  - Slide the mounting rail with the bore identified by the letter from POSITION SENSOR over the mounting bolt of the strapping band that is permanently fixed in place.
  - Position the movable strapping band and slide the mounting rail with the bore identified by the numerical value from POSITION SENSOR over the mounting bolt.

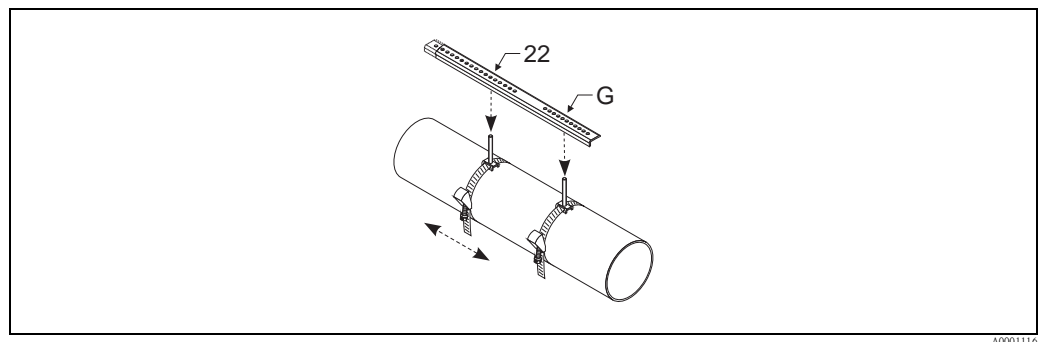
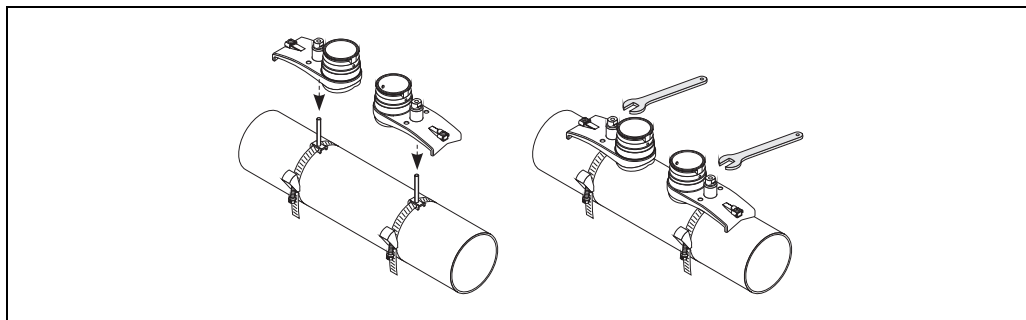


Fig. 16: Determining the distance in accordance with the mounting rail (e.g. POSITION SENSOR G22)

2. Tighten the strapping band so that it cannot slip.
3. Remove the mounting rail from the mounting bolt.

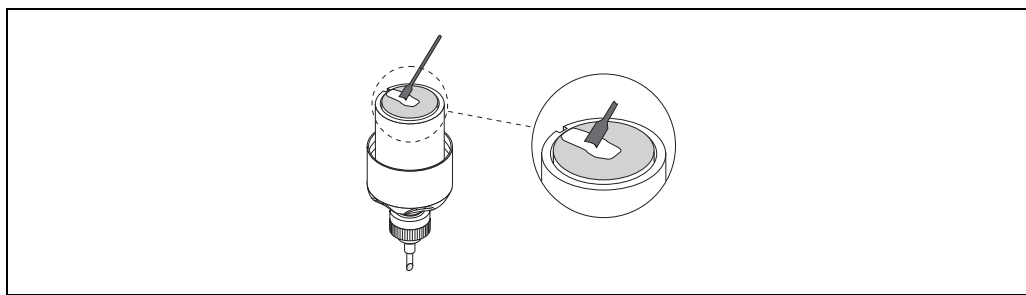
4. Fit the sensor holders over the individual mounting bolts and tighten securely with the retaining nut.



A0001117

Fig. 17: Mounting the sensor holders

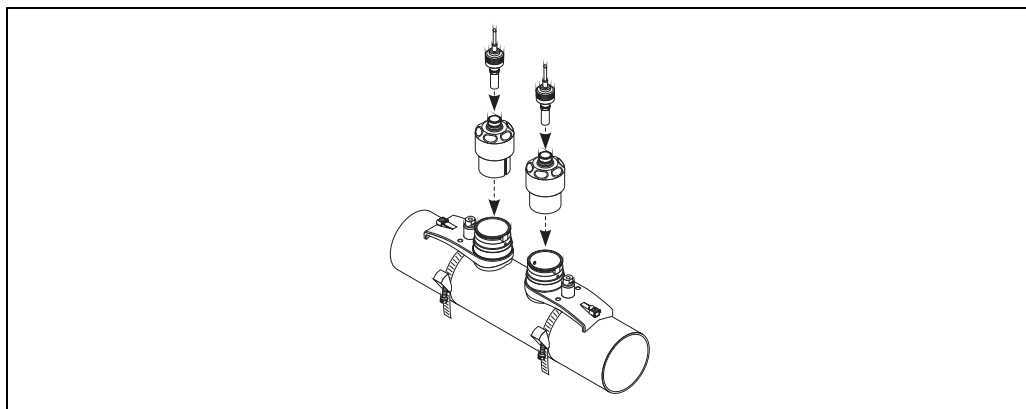
5. Coat the contact surfaces of the sensors with an even layer of coupling fluid approx. 1 mm thick, going from the groove through the center to the opposite edge.



A0001373

Fig. 18: Coating the contact surfaces of the sensor with coupling fluid

6. Insert the sensor into the sensor holder.
7. Fit the sensor cover on the sensor holder and turn until:
  - The sensor cover engages with a click
  - The arrows (▲ / ▼ "close") are pointing towards one another.
8. Screw the connecting cable into the individual sensor.



A0001376

Fig. 19: Mounting the sensor and connecting the connecting cable

This completes the mounting process. The sensors can now be connected to the transmitter via the connecting cables → 22.

### 3.3.4 Affixing the local display to the blind version

A local display can be temporarily affixed to devices which do not have a local display.

1. Switch off power supply.
2. Remove the cover of the electronics compartment.
3. Affix local display.
4. Switch on power supply.

### 3.3.5 Rotating the local display

1. Unscrew cover of the electronics compartment from the transmitter housing.
2. Remove the display module from the transmitter retainer rails.
3. Turn the display to the desired position (max.  $4 \times 45^\circ$  in each direction).
4. Place the display back on the retaining rails.
5. Screw the cover of the electronics compartment firmly back onto the transmitter housing.

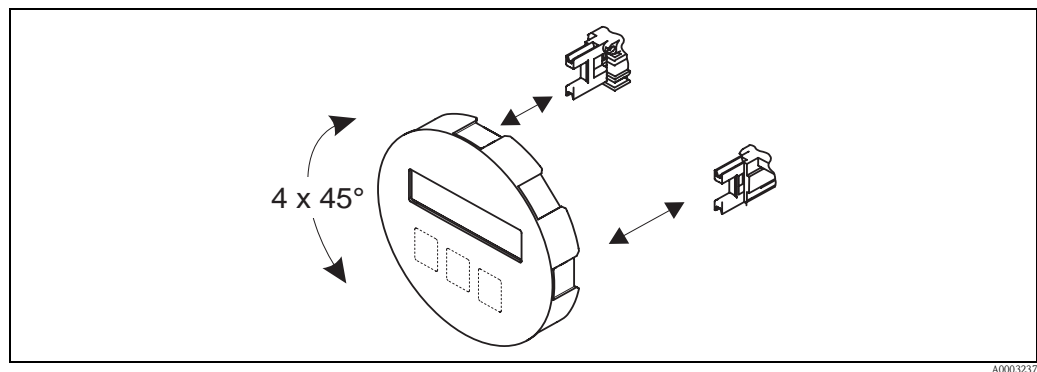


Fig. 20: Rotating the local display

A0003237

### 3.3.6 Mounting the transmitter

The transmitter can be mounted in the following ways:

- Wall mounting
- Pipe mounting (with separate mounting kit, accessories → 46)



Caution!

- The ambient temperature range (–25 to +60 °C; –13 to +140 °F) may not be exceeded at the mounting location. Avoid direct sunlight.
- If a warm pipe is used for the installation, ensure that the housing temperature does not exceed the max. permitted value of +60 °C (+140 °F).

Mount the transmitter as illustrated in → 21.

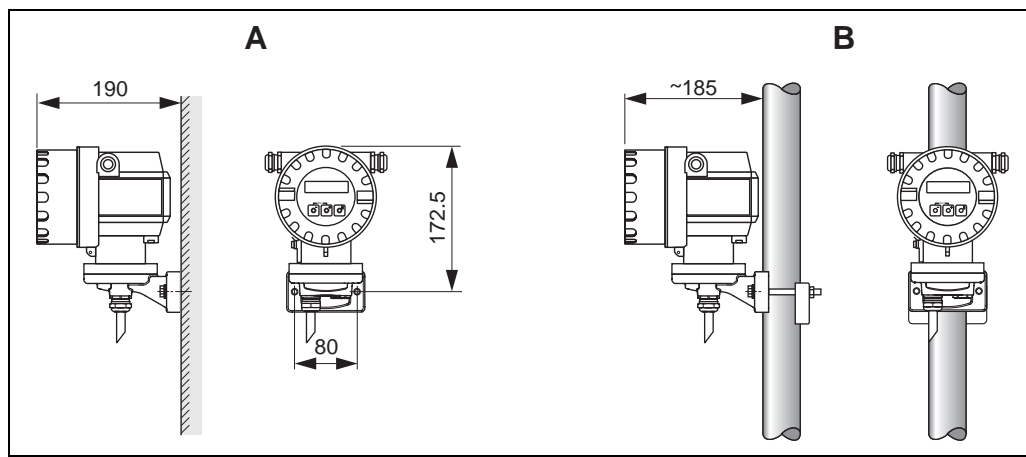


Fig. 21: Mounting the transmitter

A Direct wall mounting

B Pipe mounting

### 3.4 Post-installation check

Perform the following checks after installing the measuring device in the pipe:

Device condition and specifications	Notes
Is the device damaged (visual inspection)?	–
Does the device correspond to specifications at the measuring point, including process temperature, process pressure, ambient temperature, measuring range, etc.?	→ 64
Installation	Notes
Are the measuring point number and labeling correct (visual inspection)?	–
Process environment / process conditions	Notes
Are the inlet and outlet runs respected?	→ 12
Is the measuring device protected against moisture and direct sunlight?	–

## 4 Wiring

### 4.1 Connecting the sensor connecting cables

#### 4.1.1 Connecting Prosonic Flow W



Note!

The outer shield of the sensor connecting cable (triaxial cable) is grounded by a ground disk in the cable feedthrough (A). This grounding is absolutely essential to ensure correct measurement.

1. Unscrew the cover (c) of the cable gland (A). Remove the rubber seal (d).
2. Guide the sensor connecting cables (a, b) through the cover of the cable gland.
3. Guide the sensor connecting cables individually through the ground disk in the cable gland holder (g) and into the connection compartment.
4. Plug in the connectors of the sensor connecting cables.  
Left sensor upstream (a), right sensor downstream (b).  
The connector engages with a click when correctly plugged in.
5. Spread the rubber seal (d) along side slits (e.g. using a screwdriver) and fix the cables in place appropriately. Push up the rubber seal in the cable gland until the sensor cable sleeves are pressed against the ground disk.
6. Close the cover of the cable gland (c) so that it is tight.
7. In the connection compartment, fix the two sensor connecting cables in place in the holder (i) provided.

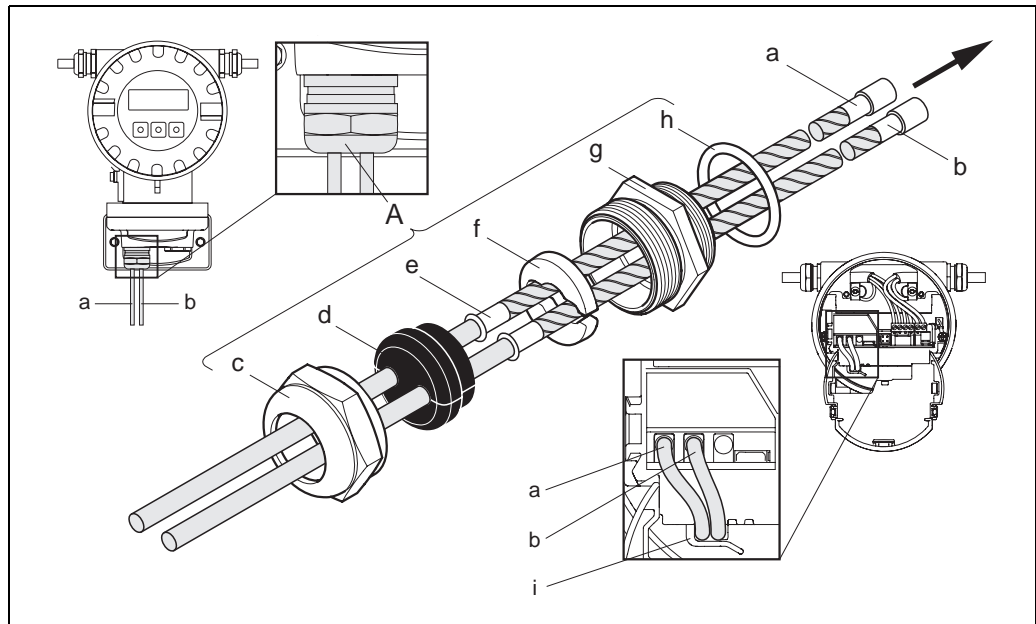


Fig. 22: Connecting the measuring system

- a, b Sensor connecting cables
- c Cable gland cover
- d Rubber seal
- e Cable fixing sleeves
- f Ground disk
- g Cable gland holder
- h Seal
- i Cable holder

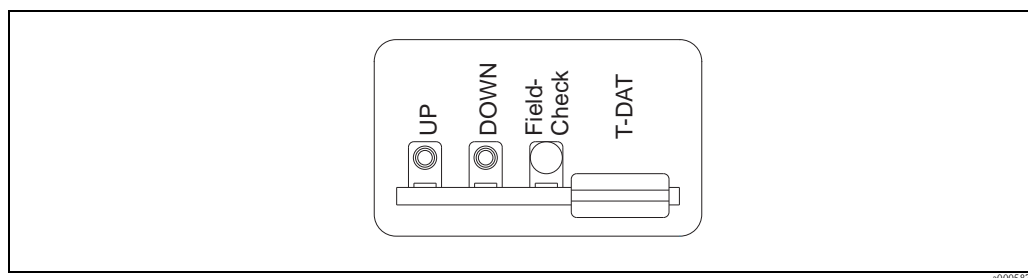


Fig. 23: Connecting nameplate for sensor connecting cables

### 4.1.2 Cable specifications

Sensor cable

- Use the ready-to-use cables supplied by Endress+Hauser with each sensor pair.
- The following cable lengths are available:
  - 5 m, 10 m, 15 m, 30 m, 60 m
  - 16 ft, 33 ft, 49 ft, 98 ft, 197 ft
- Cable material: PVC
- Operating temperature: –20 to +70 °C (–4 to +158 °F)

*Operation in zones of severe electrical interference:*

The measuring device complies with the general safety requirements in accordance with EN 61010-1, the EMC requirements of IEC/EN 61326 "Emission to class A requirements", and NAMUR Recommendation NE 21.

## 4.2 Connecting the measuring unit

### 4.2.1 Transmitter



#### Warning!

- Risk of electric shock.

Switch off the power supply before opening the device. **Do not** install or wire the device while it is connected to the power supply. Failure to comply with this precaution can result in irreparable damage to the electronics.

- Risk of electric shock.

Connect the protective earth to the ground connection on the housing before the power supply is applied.

- Compare the specifications on the nameplate with the local supply voltage and frequency.

The national regulations governing the installation of electrical equipment also apply.

- The transmitter must be included in the general circuit protection system.

1. Unscrew cover of the electronics compartment from the transmitter housing.
2. Press the side latches and flip down the cover of the connection compartment.
3. Feed the cable for the power supply and the signal cable through the appropriate cable entries.
4. Remove the terminal connectors from the transmitter housing and connect the cable for the power supply and the signal cable:
  - Wiring diagram → 24
  - Terminal assignment → 25
5. Plug the terminal connectors back into the transmitter housing.



#### Note!

The connectors are coded so you cannot mix them up.

6. Secure the ground cable to the ground terminal.
7. Flip up the cover of the connection compartment.
8. Screw the cover of the electronics compartment firmly onto the transmitter housing.

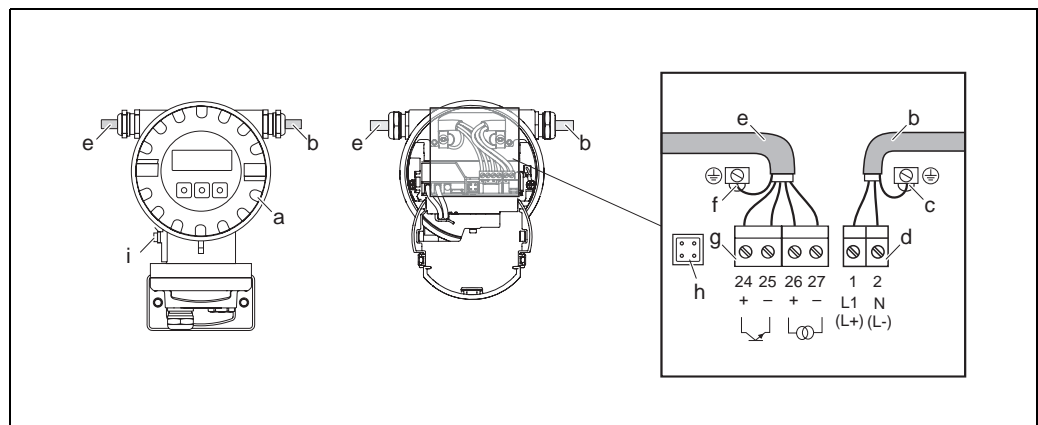



Fig. 24: Connecting the transmitter (aluminum field housing).

Cable cross-section: max. 2.5 mm<sup>2</sup> (AWG 13)

- a Electronics compartment cover
- b Cable for power supply: 85 to 250 V AC, 11 to 40 V DC, 20 to 28 V AC
- c Ground terminal for power supply cable
- d Terminal connector for power supply: **No. 1–2** → 25 (terminal assignment)
- e Signal cable
- f Ground terminal for signal cable
- g Terminal connector for signal cable: **No. 24–27** → 25 (terminal assignment)
- h Service connector
- i Ground terminal for potential equalization



## 4.2.2 Terminal assignment

Terminal No. (wiring diagram →  24)					
24 (+)	25 (-)	26 (+)	27 (-)	1 (L1/L+)	2 (N/L-)
Pulse output		HART current output		Power supply	




Note!

Functional values of the outputs and power supply →  61

## 4.2.3 HART connection

Users have the following connection options at their disposal:

- Direct connection to transmitter by means of terminals 26(+) and 27 (-)
- Connection by means of the 4 to 20 mA circuit.
- The measuring loop's minimum load must be at least 250  $\Omega$ .
- After commissioning, make the following settings:
  - CURRENT SPAN function → "4–20 mA HART"
  - Switch HART write protection on or off →  31

### Connection of the HART handheld communicator

See also the documentation issued by the HART Communication Foundation, and in particular HCF LIT 20: "HART, a technical summary".

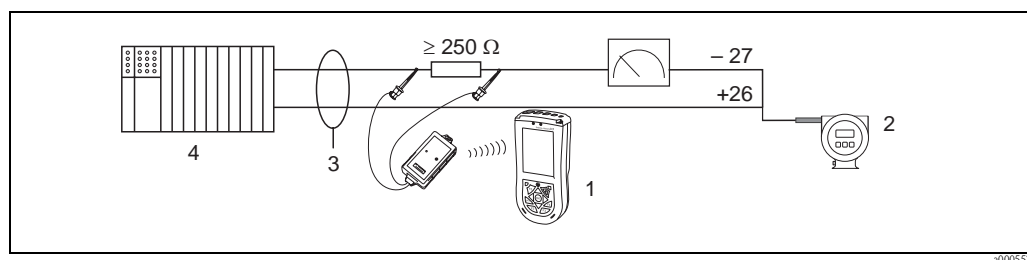


Fig. 25: Electrical connection of HART handheld Field Xpert SFX100

- 1 HART handheld Field Xpert SFX100
- 2 Auxiliary energy
- 3 Shielding
- 4 Other devices or PLC with passive input

### Connection of a PC with an operating software

In order to connect a PC with an operating software (e.g. "FieldCare), a HART modem (e.g. Commubox FXA 195) is needed.

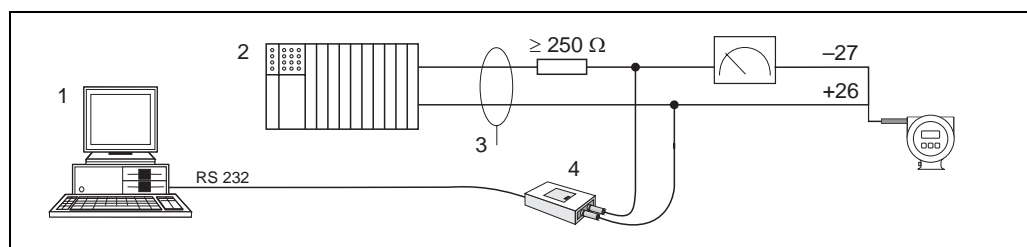


Fig. 26: Electrical connection of a PC with an operating software

- 1 PC with an operating software
- 2 Other evaluation devices or PLC with passive input
- 3 Shield
- 4 HART modem, e.g. Commubox FXA 195

### 4.3 Potential equalization

For potential equalization no special measures are necessary.

### 4.4 Degree of protection

#### Transmitter

The transmitter meets the requirements for IP 67 degree of protection. Compliance with the following points is mandatory following installation in the field or servicing, in order to ensure that IP 67 protection is maintained:

- The housing seals must be clean and undamaged when inserted into their grooves. The seals must be dried, cleaned or replaced if necessary.
- All housing screws and screw covers must be firmly tightened.
- The cables used for connection must be of the specified outside diameter → 23.
- Firmly tighten the cable entries (→ 27).
- Remove all unused cable entries and insert dummy plugs instead.
- Do not remove the grommet from the cable entry.

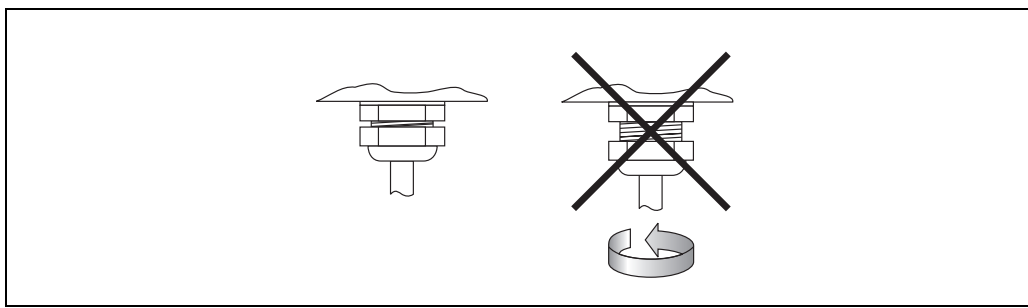


Fig. 27: Installation instructions for cable entries on the transmitter housing

#### Flowrate measuring sensors W (clamp-on)

The flowrate measuring sensors W, depending on the type, meet all the requirements for IP 67 or IP 68 degree of protection (please observe the information on the nameplate of the sensor). Compliance with the following points is mandatory following installation in the field or servicing, in order to ensure that IP 67/68 protection is maintained:

- Only use cables supplied by Endress+Hauser with the corresponding sensor connectors.
- The cable connector seals (1) must be clean, dry and undamaged when inserted in the seal groove. Replace them if necessary.
- Insert the cable connectors, do not cant and then tighten them to the stop.

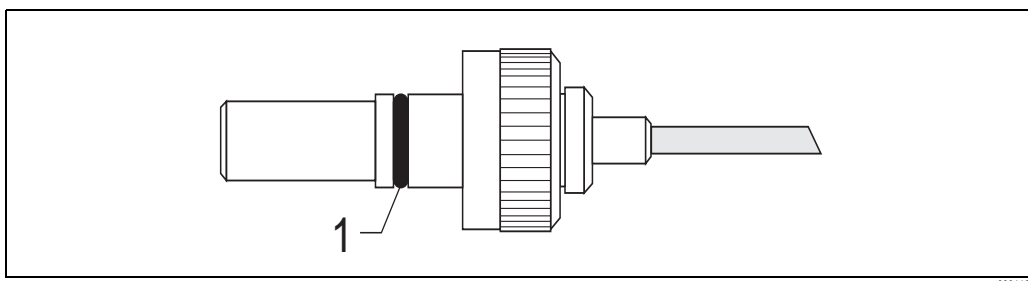





Fig. 28: Installation instructions for IP 67/68 degree of protection for sensor connectors

## 4.5 Post-connection check

Perform the following checks after completing electrical installation of the measuring device:

Device condition and specifications	Notes
Are cables or the device damaged (visual inspection)?	-
Electrical connection	Notes
Does the supply voltage match the specifications on the nameplate?	<ul style="list-style-type: none"> <li>■ 85 to 250 V AC (50 to 60 Hz)</li> <li>■ 20 to 28 V AC (50 to 60 Hz), 10 to 40 V DC</li> </ul>
Do the cables comply with the specifications?	→  23
Do the cables have adequate strain relief?	-
Is the cable type route completely isolated? Without loops and crossovers?	-
Are the power supply and signal cables correctly connected?	See the wiring diagram inside the cover of the terminal compartment
Are all screw terminals firmly tightened?	-
Have the measures for grounding/potential equalization been correctly implemented?	→  26
Are all cable entries installed, firmly tightened and correctly sealed?	→  26
Are all housing covers installed and firmly tightened?	-

## 5 Operation

### 5.1 Display and operating elements

The configured measured variables are indicated on the local display.

Diagnosis messages can appear during commissioning or in the event of a certain malfunction in operation. The diagnosis message is indicated on the display, alternating with the configured measured variable. List of diagnosis messages: → 50

The assignment of the display lines in operating mode is specified. The top line displays the volume flow and the bottom line displays the totalizer status (see Appendix on device functions → 67).

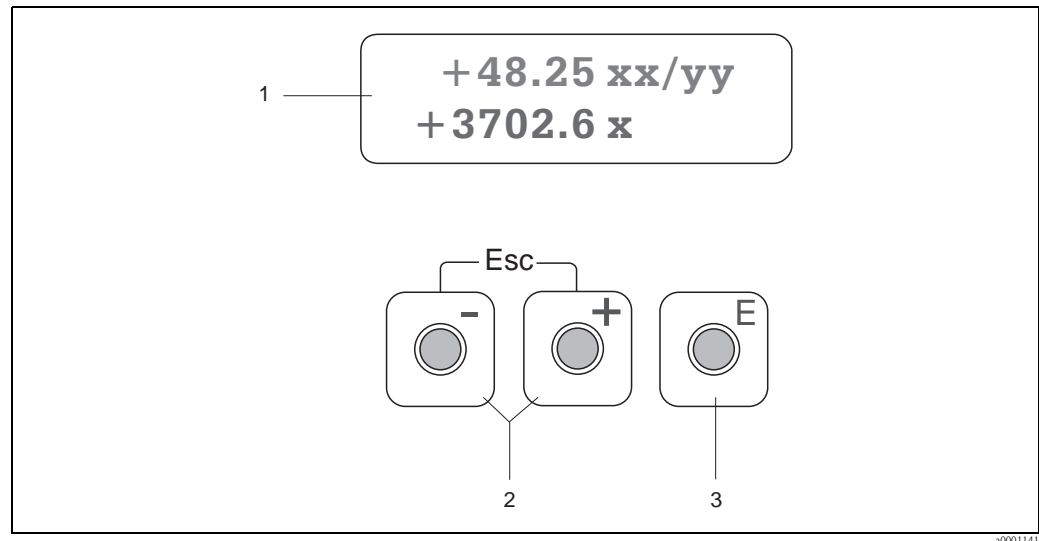


Fig. 29: Display and operating elements

**1 Liquid crystal display**

The illuminated, two-line liquid crystal display shows measured values, dialog texts and diagnosis messages. The display as it appears during standard measuring mode is known as the HOME position (operating mode).

- Top line: shows main measured values, e.g. volume flow, [e.g. in ml/min / fl.oz/min]
- Bottom line: shows additional measured variables and status variables, e.g. totalizer reading in [m<sup>3</sup> / ft<sup>3</sup>], bar graph representation, tag name
- The display alternates between a diagnosis message and the measured variable during commissioning or in the event of a malfunction in normal measuring operation.
- The first line displays the diagnosis code starting with the letters F, C, S or M. The diagnosis message is displayed on the second line as short text.

**2 Plus/minus keys**

- Enter numerical values, select parameters
- Select different function groups within the function matrix
- Press the +/- keys simultaneously to trigger the following functions:
- Exit the function matrix step by step → HOME position
- Press and hold down the +/- keys for more than 3 seconds → Return directly to HOME position
- Cancel data entry

**3 Enter key**

- HOME position → Enter the function matrix
- Save the numerical values entered or settings changed

## 5.2 Brief guide to the function matrix



Note!

- Please refer to the general notes on → 30.
- Function matrix overview → 67
- Detailed description of all functions → 69

The function matrix is a two-level construct: the function groups form one level and the groups' functions the other.

The groups are the "highest-level grouping" of the operating options for the measuring device. A number of functions is assigned to each group. You select a group in order to access the individual functions for operating and parameterizing the measuring device.

1. HOME position → → Enter the function matrix
2. Select a function group (e.g. OPERATION)
3. Select a function (e.g. LANGUAGE)  
Change parameter/enter numerical values:  
 → Select or enter enable code, parameters, numerical values  
 → Save your entries
4. Exit the function matrix:
  - Press and hold down the Esc key () for more than 3 seconds → HOME position
  - Repeatedly press Esc key () → Return step by step to HOME position

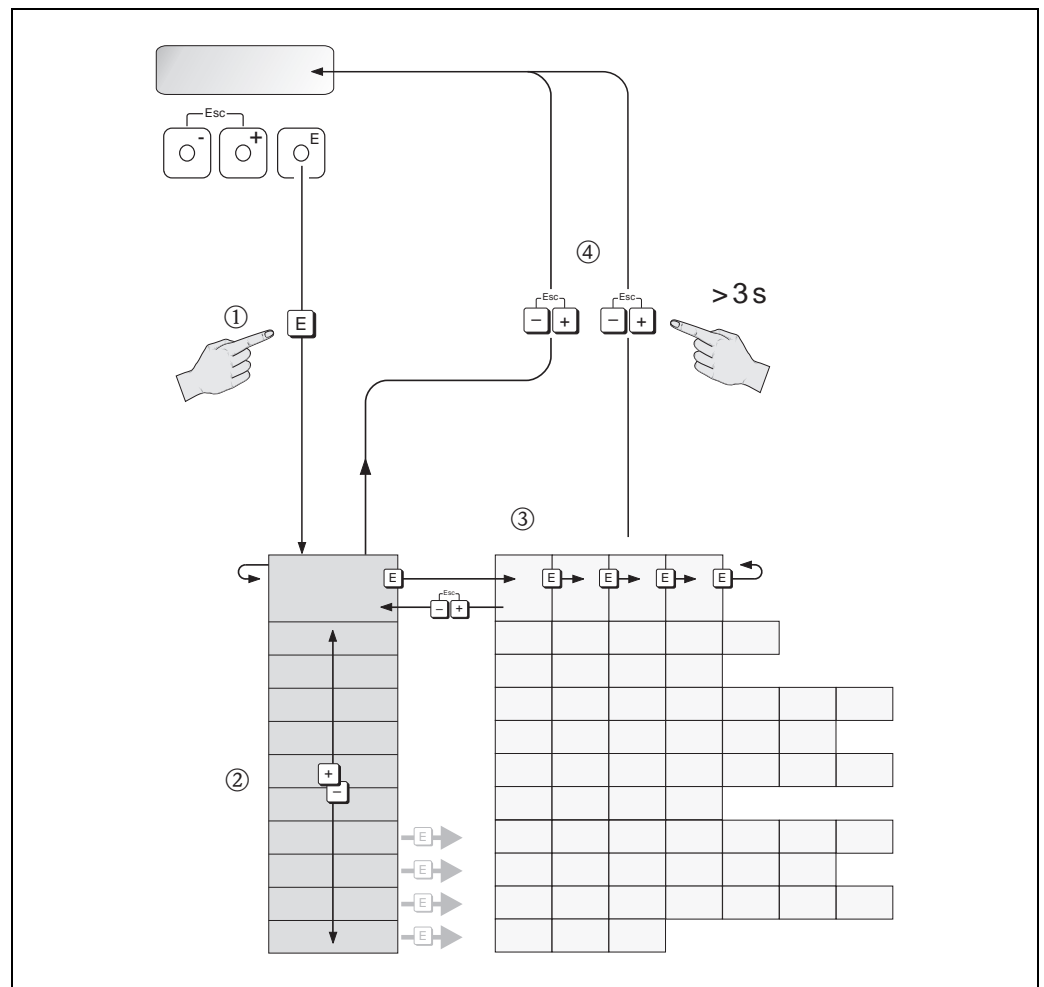






Fig. 30: Selecting functions and configuring parameters (function matrix)

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### 5.2.1 General notes

The brief commissioning guide (→  39) is adequate for commissioning a standard set-up of the transmitter. Complex measurement tasks require set-up by means of the function matrix, which comprises an additional functions. The function matrix, therefore, comprises a multiplicity of additional functions which, for the sake of clarity, are arranged in a number of function groups.

Comply with the following instructions when configuring functions:

- Select functions as described on →  29.
- Certain functions can be switched off (OFF). If functions are switched off related functions in other function groups will no longer be displayed.
- Certain functions require confirmation of the data entries.  
Press  to select "SURE [ YES ]" and press  again to confirm. The setting is saved or starts a function, as applicable.
- Return to the HOME position is automatic if no key is pressed for 5 minutes.




Note!


- The transmitter continues to measure while data entry is in progress, i.e. the current measured values are output via the signal outputs in the normal way.
- If the power supply fails all preset and configured values remain safely stored in the EEPROM.

### 5.2.2 Enabling the programming mode

The function matrix can be disabled. Disabling the function matrix rules out the possibility of inadvertent changes to device functions, numerical values or factory settings. A numerical code (factory setting = 91) has to be entered before settings can be changed.

If the "private code" is activated, this excludes the possibility of unauthorized persons accessing data, see ACCESS CODE function →  73.

Comply with the following instructions when entering codes:

- If programming is disabled and the  operating elements are pressed in any function, a prompt for the code automatically appears on the display.
- If "0" is specified as the private code, programming is always enabled.
- The Endress+Hauser service organization can be of assistance if the personal code is lost.



Caution!

Changing certain sensor specific parameters may influence characteristics of numerous functions of the entire measuring device, particularly measuring accuracy.

This type of parameters may not be changed! Please contact Endress+Hauser if you have any questions.

### 5.2.3 Disabling the programming mode

Programming is disabled if the operating elements is not pressed within 60 seconds following a return to the HOME position.

This programming is disable by entering any number in the function "ACCESS CODE" (any other than the customer's code).

## 5.3 Communication

In addition to local operation, the measuring device can also be configured and measured values obtained by means of the HART protocol. Digital communication takes place using the 4–20 mA current output HART → 25.

The HART protocol allows the transfer of measuring and device data between the HART master and the field devices for configuration and diagnostics purposes.

The HART masters, e.g. a handheld terminal or PC-based operating programs (such as FieldCare), require device description (DD) files which are used to access all the information in a HART device. Information is exclusively transferred using so-called "commands". There are three different command groups:

- **Universal commands:**

All HART devices support and use universal commands.

The following functionalities are linked to them:

- Recognizing HART devices
- Reading digital measured values (volume flow, totalizer, etc.)

- **Common practice commands:**

Common practice commands offer functions which are supported and can be executed by most but not all field devices.

- **Device-specific commands:**

These commands allow access to device-specific functions which are not HART standard. Such commands access individual field device information, (among other things), such as empty-pipe/full-pipe adjustment values, low flow settings etc.



**Note!**

The measuring device has access to all three command classes. A list of all the "Universal commands" and "Common Practice Commands" can be found on → 33.

### 5.3.1 Operating options

For the complete operation of the measuring device, including device-specific commands, there are device description (DD) files available to the user to provide the following operating aids and programs:

#### **Field Xpert HART Communicator**

Selecting device functions with a HART Communicator is a process involving a number of menu levels and a special HART function matrix. The HART manual in the carrying case of the HART Communicator contains more detailed information on the device.

#### **Operating program "FieldCare"**

FieldCare is Endress+Hauser's FDT-based plant asset management tool and allows the configuration and diagnosis of intelligent field devices. By using status information, you also have a simple but effective tool for monitoring devices. The Proline flowmeters are accessed via a service interface or via the service interface FXA291.

#### **Operating program "SIMATIC PDM" (Siemens)**

SIMATIC PDM is a standardized, manufacturer-independent tool for the operation, configuration, maintenance and diagnosis of intelligent field devices.

#### **Operating program "AMS" (Emerson Process Management)**

AMS (Asset Management Solutions): program for operating and configuring devices.



**Note!**

In the CURRENT SPAN function, the HART protocol demands the setting "4 to 20 mA HART" or "4-20 mA (25 mA) HART".

HART write protection can be disabled or enabled by means of a jumper on the I/O board.

### 5.3.2 Device description files for operating programs

The following section illustrates the suitable device description file for the operating program in question and then indicates where this file can be obtained.

<b>Valid for device software:</b>	V 1.01.XX	→ Function DEVICE SOFTWARE
<b>HART device data:</b>		
Manufacturer ID:	11 <sub>hex</sub> (ENDRESS+HAUSER)	→ Function MANUFACT ID
Device ID:	62 <sub>hex</sub> (98 <sub>dec</sub> )	→ Function DEVICE ID
Device Revision:	1	
DD Revision:	1	
<b>Software release:</b>	02.2010	
Operating program/device description:	Sources for obtaining device descriptions/program updates:	
Handheld terminal Field Xpert SFX100	Use update function of handheld terminal	
FieldCare / DTM	<ul style="list-style-type: none"> <li>■ www.endress.com → Download</li> <li>■ CD-ROM (Endress+Hauser order number 56004088)</li> <li>■ DVD (Endress+Hauser order number 70100690)</li> </ul>	
AMS	www.endress.com → Download	
SIMATIC PDM	www.endress.com → Download	

Tester/simulator:	Sources for obtaining device descriptions:
Fieldcheck	Update via FieldCare using the Flow Device FXA193/291 DTM in the Fieldflash module



Note!

The Fieldcheck tester/simulator is used for testing flowmeters in the field. When used in conjunction with the "FieldCare" software package, test results can be imported into a database, printed and used for official certification. Contact your Endress+Hauser representative for more information.

### 5.3.3 Device variables

*Device variables:*

The following device variables are available using the HART protocol:

ID (decimal)	Device variable
0	OFF (not assigned)
30	Volume flow
250	Totalizer 1

*Process variables:*




At the factory, the process variables are assigned to the following device variables:





- Primary process variable (PV) → Volume flow
- Second process variable (SV) → Totalizer




### 5.3.4 Universal / common practice HART commands






The following table contains all the universal commands supported by the device.



Command No. HART command / Access type		Command data (numeric data in decimal form)	Response data (numeric data in decimal form)
<b>Universal Commands</b>			
0	Read unique device identifier Access type = Read	none	<p>Device identification delivers information on the device and the manufacturer. It cannot be changed.</p> <p>The response consists of a 12-byte device ID:</p> <ul style="list-style-type: none"> <li>– Byte 0: fixed value 254</li> <li>– Byte 1: manufacturer ID, 17 = E+H</li> <li>– Byte 2: device type ID, 98 = Prosonic Flow 91</li> <li>– Byte 3: number of preambles</li> <li>– Byte 4: universal commands rev. no.</li> <li>– Byte 5: device-specific commands rev. no.</li> <li>– Byte 6: software revision</li> <li>– Byte 7: hardware revision</li> <li>– Byte 8: additional device information</li> <li>– Byte 9-11: device identification</li> </ul>
1	Read primary process variable Access type = Read	none	<ul style="list-style-type: none"> <li>– Byte 0: HART unit code of the primary process variable</li> <li>– Bytes 1-4: primary process variable</li> </ul> <p>Factory setting: primary process variable = Volume flow</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ You can set or change the assignment of device variables to process variables using Command 51.</li> <li>■ Manufacturer-specific units are represented using the HART unit code "240".</li> </ul>
2	Read the primary process variable as current in mA and percentage of the set measuring range Access type = Read	none	<ul style="list-style-type: none"> <li>– Byte 0-3: current current of the primary process variable in mA</li> <li>– Byte 4-7: %- value of the set measuring range</li> </ul> <p>Factory setting: primary process variable = Volume flow</p> <p> <b>Note!</b></p> <p>You can set or change the assignment of device variables to process variables using Command 51.</p>
3	Read the primary process variable as current in mA and four (preset using Command 51) dynamic process variables Access type = Read	none	<p>24 bytes are sent as a response:</p> <ul style="list-style-type: none"> <li>– Bytes 0-3: primary process variable current in mA</li> <li>– Byte 4: HART unit code of the primary process variable</li> <li>– Bytes 5-8: primary process variable</li> <li>– Byte 9: HART unit code of the secondary process variable</li> <li>– Bytes 10-13: second process variable</li> <li>– Byte 14: HART unit code of the third process variable</li> <li>– Bytes 15-18: third process variable</li> <li>– Byte 19: HART unit code of the fourth process variable</li> <li>– Bytes 20-23: fourth process variable</li> </ul> <p><i>Factory setting:</i></p> <ul style="list-style-type: none"> <li>■ Primary process variable = Volume flow</li> <li>■ Secondary process variable = Totalizer</li> <li>■ Third process variable = Sound velocity</li> <li>■ Fourth process variable = Flow velocity</li> </ul> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ Manufacturer-specific units are represented using the HART unit code "240".</li> </ul>

Command No. HART command / Access type		Command data (numeric data in decimal form)	Response data (numeric data in decimal form)
6	Set HART shortform address Access type = Write	Byte 0: desired address (0 to 15) Factory setting: 0  Note! With an address > 0 (multidrop mode), the current output of the primary process variable is set to 4 mA.	Byte 0: active address
11	Read unique device identification using the TAG (measuring point designation) Access type = Read	Bytes 0-5: TAG	Device identification delivers information on the device and the manufacturer. It cannot be changed.  The response consists of a 12-byte device ID if the given TAG agrees with the one saved in the device: <ul style="list-style-type: none"> <li>– Byte 0: fixed value 254</li> <li>– Byte 1: manufacturer ID, 17 = E+H</li> <li>– Byte 2: device type ID, 98 = Prosonic Flow 91</li> <li>– Byte 3: number of preambles</li> <li>– Byte 4: universal commands rev. no.</li> <li>– Byte 5: device-specific commands rev. no.</li> <li>– Byte 6: software revision</li> <li>– Byte 7: hardware revision</li> <li>– Byte 8: additional device information</li> <li>– Byte 9-11: device identification</li> </ul>
12	Read user message Access type = Read	none	Bytes 0-24: user message  Note! You can write the user message using Command 17.
13	Read TAG, TAG description and date Access type = Read	none	<ul style="list-style-type: none"> <li>– Bytes 0-5: TAG</li> <li>– Byte 6-17: TAG description</li> <li>– Bytes 18-20: date</li> </ul>  Note! You can write the TAG, TAG descriptor and date using Command 18.
14	Read sensor information on primary process variable	none	<ul style="list-style-type: none"> <li>– Bytes 0-2: sensor serial number</li> <li>– Byte 3: HART unit code of the sensor limits and measuring range of the primary process variable</li> <li>– Bytes 4-7: upper sensor limit</li> <li>– Bytes 8-11: lower sensor limit</li> <li>– Bytes 12-15: minimum span</li> </ul>  Note! <ul style="list-style-type: none"> <li>■ The data relate to the primary process variable (= volume flow).</li> <li>■ Manufacturer-specific units are represented using the HART unit code "240".</li> </ul>

Command No. HART command / Access type		Command data (numeric data in decimal form)	Response data (numeric data in decimal form)
15	Read output information of primary process variable Access type = Read	none	<ul style="list-style-type: none"> <li>– Byte 0: alarm selection ID</li> <li>– Byte 1: transfer function code</li> <li>– Byte 2: HART unit code for the set measuring range of the primary process variable</li> <li>– Bytes 3-6: end of measuring range, value for 20 mA</li> <li>– Bytes 7-10: start of measuring range, value for 4 mA</li> <li>– Bytes 11-14: attenuation constant in [s]</li> <li>– Byte 15: write protection code</li> <li>– Byte 16: OEM dealer code, 17 = E+H</li> </ul> <p>Factory setting: primary process variable = Volume flow</p> <p> Note!</p> <p>■ Manufacturer-specific units are represented using the HART unit code "240".</p>
16	Read the device production number Access type = Read	none	Bytes 0-2: production number
17	Write user message Access = Write	Any 32-character long text can be saved in the device under this parameter: Bytes 0-23: desired user message	Displays the current user message in the device: Bytes 0-23: current user message in the device
18	Write TAG, TAG descriptor and date Access = Write	With this parameter, you can store an 8-character TAG, a 16-character TAG description and a date: <ul style="list-style-type: none"> <li>– Bytes 0-5: TAG</li> <li>– Byte 6-17: TAG description</li> <li>– Bytes 18-20: date</li> </ul>	Displays the current information in the device: <ul style="list-style-type: none"> <li>– Bytes 0-5: TAG</li> <li>– Byte 6-17: TAG description</li> <li>– Bytes 18-20: date</li> </ul>
19	Write the device production number Access = Write	Bytes 0-2: production number	Bytes 0-2: production number

The following table contains all the common practice commands supported by the device.

Command No. HART command / Access type		Command data (numeric data in decimal form)	Response data (numeric data in decimal form)
<b>Common practice commands</b>			
34	Write damping value for primary process variable Access = Write	Byte 0-3: damping value of the primary process variable in seconds Factory setting: Primary process variable = Volume flow	Displays the current attenuation constant in the device: Bytes 0-3: attenuation constant in seconds
35	Write measuring range of primary process variable Access = Write	Write the desired measuring range: – Byte 0: HART unit code for the primary process variable – Byte 1-4: end of measuring range, value for 20 mA – Bytes 5-8: start of measuring range, value for 4 mA Factory setting: Primary process variable = Volume flow  Note! ■ If the HART unit code is not the correct one for the process variable, the device will continue with the last valid unit.	The currently set measuring range is shown as the response: – Byte 0: HART unit code for the set measuring range of the primary process variable – Byte 1-4: end of measuring range, value for 20 mA – Bytes 5-8: start of measuring range, value for 4 mA  Note! Manufacturer-specific units are represented using the HART unit code "240".
38	Device status reset "Configuration changed" Access = Write	none  Note! This HART command can also be executed if the write protection is switched on (= ON)!	none
40	Simulate output current of primary process variable Access = Write	Simulation of the desired output current of the primary process variable. An entry value of 0 exits the simulation mode: Byte 0-3: output current in mA Factory setting: Primary process variable = Volume flow	The momentary output current of the primary process variable is displayed as a response: Byte 0-3: output current in mA
42	Perform device reset Access = Write	none	none
44	Write unit of primary process variable Access = Write	Specify the unit of the primary process variable. Only units which are suitable for the process variable are accepted by the device: Byte 0: HART unit code Factory setting: Primary process variable = Volume flow  Note! ■ If the written HART unit code is not the correct one for the process variable, the device will continue with the last valid unit. ■ A change of the unit of the primary process variable has a direct impact on the system units.	The current unit code of the primary process variable is displayed as a response: Byte 0: HART unit code  Note! Manufacturer-specific units are represented using the HART unit code "240".
48	Read extended device status Access = Read	none	The current device status is displayed in extended form as the response: Encoding: see Table → 38.

Command No. HART command / Access type		Command data (numeric data in decimal form)	Response data (numeric data in decimal form)
50	Read assignment of the device variables to the four process variables Access = Read	none	<p>Display of the current variable assignment of the process variables:</p> <ul style="list-style-type: none"> <li>– Byte 0: device variable code for the primary process variable</li> <li>– Byte 1: device variable code for the second process variable</li> <li>– Byte 2: device variable code for the third process variable</li> <li>– Byte 3: device variable code for the fourth process variable</li> </ul> <p>Factory setting:</p> <ul style="list-style-type: none"> <li>■ Primary process variable: code 30 for volume flow</li> <li>■ Secondary process variable: code 250 for totalizer</li> <li>■ Third process variable: code 40 for sound velocity</li> <li>■ Fourth process variable: code 49 for flow velocity</li> </ul>
53	Write device variable unit Access = Write	<p>This command sets the unit of the given device variables. Only those units which suit the device variable are transferred:</p> <ul style="list-style-type: none"> <li>– Byte 0: device variable code</li> <li>– Byte 1: HART unit code</li> </ul> <p>Code of the supported device variables: See data → 32</p> <p> Note!</p> <ul style="list-style-type: none"> <li>■ If the written unit is not the correct one for the device variable, the device will continue with the last valid unit.</li> <li>■ A change of the unit of the primary process variable has a direct impact on the system units.</li> </ul>	<p>The current unit of the device variables is displayed in the device as a response:</p> <ul style="list-style-type: none"> <li>– Byte 0: device variable code</li> <li>– Byte 1: HART unit code</li> </ul> <p> Note!</p> <p>Manufacturer-specific units are represented using the HART unit code "240".</p>
59	Set number of preambles in message responses Access = Write	<p>This parameter sets the number of preambles which are inserted in the message responses:</p> <p>Byte 0: number of preambles (2 to 20)</p>	<p>As a response, the current number of the preambles is displayed in the response message:</p> <p>Byte 0: number of preambles</p>

### 5.3.5 Device status/diagnosis messages

You can read the extended device status, in this case, current diagnosis messages, via Command "48". The command delivers bit-encoded information (see table below).



Note!



- For detailed information on the device status/diagnosis messages and how they are rectified → 50
- Bits and bytes not listed are not assigned.

Byte	Bit	Diagnosis code	Brief description of the diagnosis message
0	0	C - 284	Software update
	1	C - 481	Diagnosis active
	2	C - 281	Initialization
	3	C - 411	Upload/download
	4	F - 001	Device fault
	5	F - 282	Data storage
	6	F - 283	Memory contents
	7	F - 062	Sensor connection
1	0	F - 062	Sensor connection
	1	F - 881	Sensor signal
	2	C - 431	Calibration
	3	C - 412	Writing backup
	4	C - 413	Reading backup
	5	C - 461	Signal output
	6	C - 453	Hide value
	7	C - 484	Simulation error
2	0	C - 485	Simulation value
	1	C - 482	Simulation output
	2	C - 482	Simulation output
	3	C - 482	Simulation output
	4	C - 482	Simulation output
	5	S - 461	Signal output
	6	S - 461	Signal output
	7	S - 461	Signal output
3	0	S - 437	Configuration
	1	S - 437	Configuration
	2	-	-
	3	-	-
	4	-	-
	5	-	-
	6	-	-
	7	-	-

## 6 Commissioning

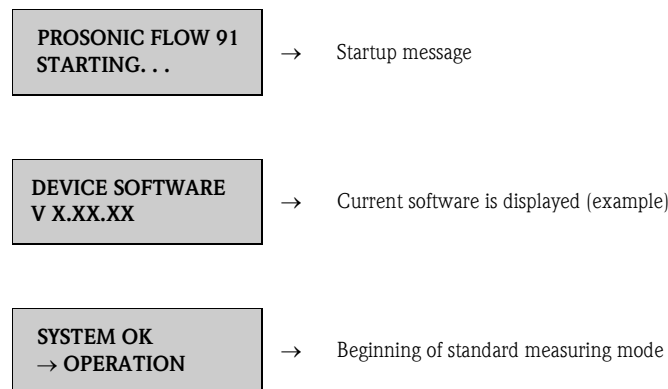
### 6.1 Function check

Make sure that all final checks have been completed before you commission your measuring point:

- "Post-installation check" checklist →  21
- "Post-connection check" checklist →  27

### 6.2 Switching on the measuring device

Once the post-connection checks have been successfully completed, it is time to switch on the supply voltage. The device is ready for operation! The measuring device performs a number of self-tests after power-on. As this procedure progresses the following sequence of messages appears on the local display:



Normal measuring mode commences as soon as startup completes. Various measured value and/or status variables appear on the display (HOME position).



**Note!**

If startup fails, an error message indicating the cause is displayed.

## 6.3 Commissioning via a configuration program

### 6.3.1 Sensor Setup/sensor installation

For sensor installation with the configuration program "FieldCare" any "Quick Setup" menus which correspond to the local operation exist.

Other methods (see table) are available for determining the relevant values for sensor distance, wire length, etc. The procedure is illustrated in detail on → 40.

Sensor type	Required values for the sensor installation procedure	Local display <sup>1)</sup>	FieldCare <sup>2)</sup>	Applicator <sup>3)</sup>
clamp-on version	Position sensor	x	x	x
	Wire length	x	x	x
	Sensor distance	x	x	x

<sup>1)</sup> Conditions that must be met before determining the values via the local display using the "Sensor" Sensor Setup (→ 70):

- Transmitter installed (→ 21)
- Transmitter connected to power supply (→ 24)

<sup>2)</sup> FieldCare is a configuration software package for flowmeters in the field. Conditions that must be met before determining the values via "FieldCare":

- Transmitter installed (→ 21)
- Transmitter connected to power supply (→ 24)
- "FieldCare" configuration package installed on a notebook/PC
- Connection made between notebook/PC and device via the FXA291 service interface (→ 24)

<sup>3)</sup> Applicator is software for selecting and configuring flowmeters. The values required can be determined without having to connect the transmitter beforehand.

The "Applicator" can be downloaded from the Internet (→ [www.applicator.com](http://www.applicator.com)) or ordered on CD-ROM for installation on a local PC.

#### Procedure (determining data for sensor installation)

The following table can be used to select and configure, the functions required to install the sensor:





Note!


Enter a valid release code to allow that device parameters can be changed or activated. The code (factory setting = 91) is entered by means of the corresponding matrix cell.

"Clamp-on" sensor installation	
Procedure Selection - Input - display	Local display (Sensor Setup) ▼
Liquid in the pipe	LIQUID
Liquid temperature	TEMPERATURE
Liquid sound velocity	SOUND VELOCITY LIQUID
Pipe material	PIPE MATERIAL
Pipe sound velocity	SOUND VELOCITY PIPE
Pipe circumference	CIRCUMFERENCE
Pipe diameter	PIPE DIAMETER
Wall thickness	WALL THICKNESS
Liner material	LINER MATERIAL
Liner sound velocity	SOUND VELOCITY LINER
Liner thickness	LINER THICKNESS
Sensor type	SENSOR TYPE
Sensor configuration	SENSOR CONFIGURATION



<b>"Clamp-on" sensor installation</b>	
<b>Procedure Selection - Input - display</b>	<b>Local display (Sensor Setup) ▼</b>
<b>Cable length</b>	CABLE LENGTH
<b>Display sensor position</b> (for sensor installation)	POSITION SENSOR
<b>Display wire length</b> (for sensor installation)	WIRE LENGTH
<b>Display sensor distance</b> (for sensor installation)	SENSOR DISTANCE
 <b>Note!</b> A detailed description of all the functions can be found on →  67	

### 6.3.2 Commissioning

Additionally to the settings for the sensor installation (→  40) the following functions have to be configured for the standard application:

- System units
- Outputs

### 6.3.3 Data backup/transmission

Using the T-DAT SAVE/LOAD function (→ 74), you can transfer data (device parameters and settings) between the T-DAT (exchangeable memory) and the EEPROM (device storage unit).

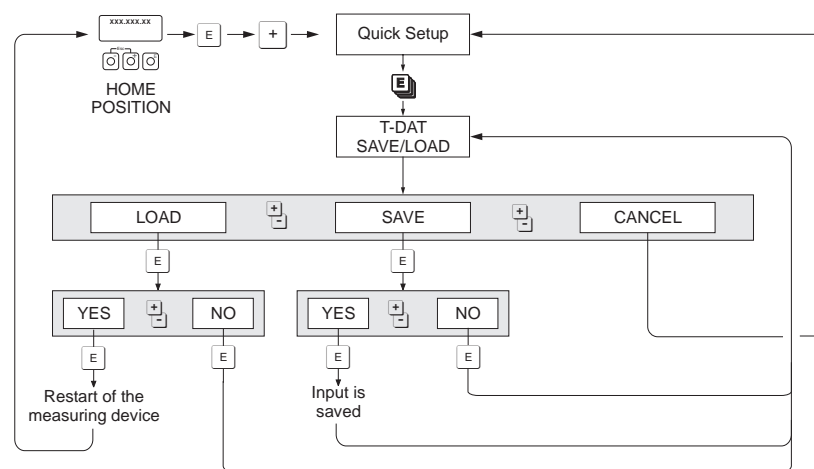
This is required in the following instances:

- Creating a backup: current data are transferred from an EEPROM to the T-DAT.
- Replacing a transmitter: current data are copied from an EEPROM to the T-DAT and then transferred to the EEPROM of the new transmitter.
- Duplicating data: current data are copied from an EEPROM to the T-DAT and then transferred to EEPROMs of identical measuring points.



Hinweis!

For information on installing and removing the T-DAT → 55



a0001221-en

Fig. 31: Data backup/transmission with T-DAT SAVE/LOAD function

Information on the LOAD and SAVE options available:

**LOAD:** Data are transferred from the T-DAT to the EEPROM.



Hinweis!

- Any settings already saved on the EEPROM are deleted.
- This option is only available, if the T-DAT contains valid data.
- This option can only be executed if the software version of the T-DAT is the same or newer than that of the EEPROM. Otherwise, the error message "TRANSM. SW-DAT" appears after restarting and the LOAD function is then no longer available.

**SAVE:**

Data are transferred from the EEPROM to the T-DAT

## 6.4 Application specific commissioning

### 6.4.1 Zero point adjustment


Consequently, zero point adjustment is generally not necessary.

Experience shows that the zero point adjustment is advisable only in special cases:

- To achieve highest measuring accuracy also with very small flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).


Preconditions for a zero point adjustment

Note the following before performing a zero point adjustment:

- A zero point adjustment can be performed only with fluids that contain no gas or solid contents.
- Zero point adjustment is performed with the pipe completely filled and at zero flow ( $v = 0 \text{ m/s}$ ). This can be achieved, for example, with shutoff valves upstream and/or downstream of the measuring range or by using existing valves and gates (→  32).
  - Standard operation → valves 1 and 2 open
  - Zero point adjustment with pump pressure → valve 1 open / valve 2 closed
  - Zero point adjustment without pump pressure → valve 1 closed / valve 2 open



Caution!

- If the fluid is very difficult to measure (e.g. containing entrained solids or gas) it may prove impossible to obtain a stable zero point despite repeated zero point adjustments. In instances of this nature, please contact your Endress+Hauser service center.
- You can view the currently valid zero point value using the "ZERO POINT" function (→  95).

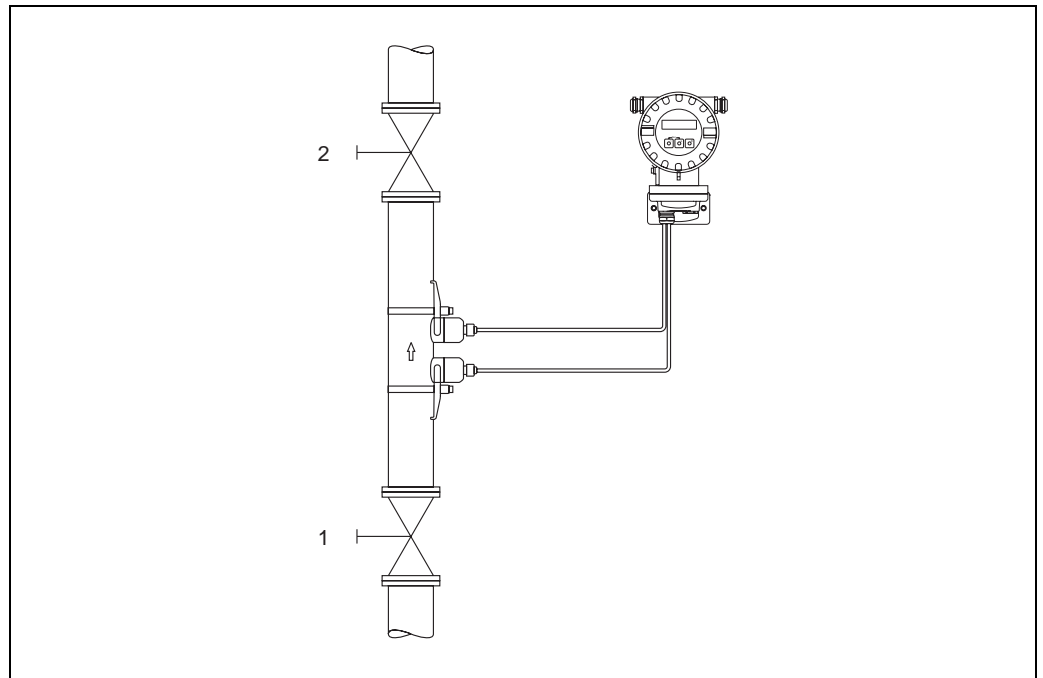












Fig. 32: Zero point adjustment and shutoff valves

Performing a zero point adjustment

1. Operate the system until normal operating conditions resume.
2. Stop the flow ( $v = 0 \text{ m/s}$ ).
3. Check the shutoff valves for leaks.
4. Check that operating pressure is correct.


5. Using the local display, select the "ZERO POINT ADJUSTMENT" function in the function matrix:  
 HOME →  →  → PROCESS PARAMETER  
 PROCESS PARAMETER →  →  → ZERO POINT ADJ.
6. When you press OS you are automatically prompted to enter the code if the function matrix is still disabled. Enter the code.
7. Use   to select START and press  to confirm.  
 Select YES at the prompt and press  again to confirm. Zero point adjustment now starts.
  - The message "ZEROPOINT ADJUST RUNNING" appears on the display for 30 to 60 seconds while adjustment is in progress.
  - If the fluid velocity in the pipe exceeds 0.1 m/s, the following error message appears on the display: ZERO ADJUST NOT POSSIBLE.
  - When the zero point adjustment is completed, the "ZERO ADJUST." function reappears on the display.
8. Back to the HOME position
  - Press and hold down Esc key () for more than 3 seconds
  - Repeatedly press and release the Esc key ()

## 6.5 Data storage devices

At Endress+Hauser, the term HistoROM refers to various types of data storage modules on which process and measuring device data are stored. By plugging and unplugging such modules, device configurations can be duplicated onto other measuring devices to cite just one example.

### 6.5.1 HistoROM/T-DAT (transmitter DAT)

The T-DAT is an exchangeable data storage device in which all transmitter parameters and settings are stored.

Storing of specific parameter settings from the device memory (EEPROM) to the T-DAT module and vice versa must be carried out by the user (= manual save function). Detailed instructions regarding this can be found on →  74.

## 7 Maintenance

No special maintenance work is required.

### 7.1 Exterior cleaning

When cleaning the exterior of measuring devices, always use cleaning agents that do not attack the surface of the housing and the seals.

### 7.2 Coupling fluid

A coupling fluid is required to ensure the acoustic link between the sensor and the piping. This is applied to the sensor surface during commissioning. Periodic replacement of the coupling fluid is usually not required.



Note!

If too much coupling fluid is applied, signal transmission is reduced by up to 10 dB.

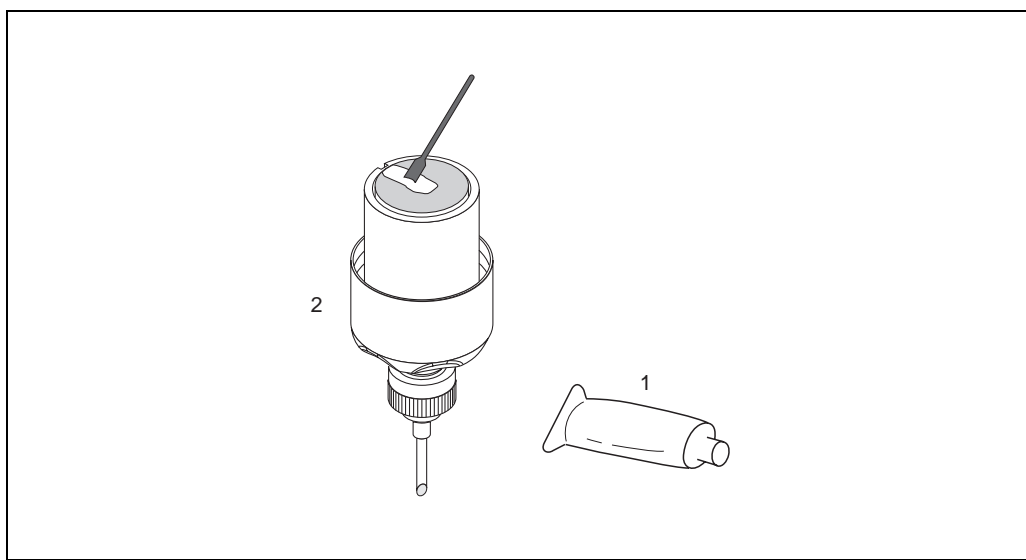


Fig. 33: Application of the coupling fluid

- 1 Coupling fluid
- 2 Sensor surface, Prosonic Flow W

## 8 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. Your Endress+Hauser service organization can provide detailed information on the order code in question.

### 8.1 Device-specific accessories

Accessory	Description	Order code
Sensor W (DN 50 to 4000) Clamp-on version	DN 50 to 300, -20 to +80 °C (2" to 12", -4 to +176 °F) <ul style="list-style-type: none"> <li>■ IP 67 / NEMA 4X</li> <li>■ IP 68 / NEMA 6P</li> </ul>	DK9WS - B* DK9WS - N*
	DN 100 to 4000, -20 to +80 °C (4" to 160", -4 to +176 °F) <ul style="list-style-type: none"> <li>■ IP 67 / NEMA 4X</li> <li>■ IP 68 / NEMA 6P</li> </ul>	DK9WS - A* DK9WS - M*
	DN 100 to 4000, 0 to +130 °C (4" to 160", +32 to +266 °F) <ul style="list-style-type: none"> <li>■ IP 67 / NEMA 4X</li> </ul>	DK9WS - P*
	DN 50 to 300, 0 to +130 °C (2" to 12", +32 to +266 °F) <ul style="list-style-type: none"> <li>■ IP 67 / NEMA 4X</li> </ul>	DK9WS - S*

### 8.2 Accessories specific to measuring principle

Accessory	Description	Order code
Mounting kit for aluminum field housing	Mounting kit for wall-mount housing.	DK9WM - C
Sensor holder set	<ul style="list-style-type: none"> <li>■ Prosonic Flow W (DN 50 to 4000, 2" to 160")            – Sensor holder, fixed retaining nut, clamp-on version</li> </ul>	DK9SH - A
Clamp-on installation set Clamp On	Sensor fastening for Prosonic Flow W (DN 50 to 4000, 2" to 160") <ul style="list-style-type: none"> <li>■ Without sensor fastening</li> <li>■ Strapping bands DN 50 to 200 (2" to 8")</li> <li>■ Strapping bands DN 200 to 600 (8" to 24")</li> <li>■ Strapping bands DN 600 to 2000 (24" to 80")</li> <li>■ Strapping bands DN 2000 to 4000 (80" to 160")</li> </ul> Without mounting tools <ul style="list-style-type: none"> <li>■ Spacing ruler DN 50 to 200 (2" to 8")</li> <li>■ Spacing ruler DN 200 to 600 (8" to 24")</li> <li>■ Fastener, 1 Traverse DN 50 to 4000 (2" to 160")</li> </ul>	DK9IC - A* DK9IC - B* DK9IC - C* DK9IC - D* DK9IC - E* DK9IC - *1 DK9IC - *2 DK9IC - *3 DK9IC - *6
Conduit adapter for connecting cable	Prosonic Flow W (DN 50 to 4000) <ul style="list-style-type: none"> <li>■ Conduit adapter incl. cable entry M20× 1,5</li> <li>■ Conduit adapter incl. cable entry ½" NPT</li> <li>■ Conduit adapter incl. cable entry G ½"</li> </ul>	DK9CB - AB1 DK9CB - AB2 DK9CB - AB3
Connecting cable	5 m (16 ft) sensor cable, PVC, -20 to +70 °C (-4 to 158 °F) 10 m (33 ft) sensor cable, PVC, -20 to +70 °C (-4 to 158 °F) 15 m (49 ft) sensor cable, PVC, -20 to +70 °C (-4 to 158 °F) 30 m (98 ft) sensor cable, PVC, -20 to +70 °C (-4 to 158 °F) 60 m (197 ft) sensor cable, PVC, -20 to +70 °C (-4 to 158 °F)	DK9SS - ABA DK9SS - ABB DK9SS - ABC DK9SS - ABD DK9SS - ABJ
Acoustic coupling fluid	<ul style="list-style-type: none"> <li>■ Coupling fluid 0 to 170 °C (+32 to 338 °F), Standard</li> <li>■ Adhesive coupling fluid -40 to +80 °C (-40 to 176 °F)</li> <li>■ Water-soluble coupling fluid -20 to +80 °C (-4 to 176 °F)</li> <li>■ SilGel -40 to +130 °C (-40 to +266 °F)</li> <li>■ Coupling fluid DDU 19, -20 to +60 °C (-4 to 140 °F)</li> <li>■ Coupling fluid -40 to +80 °C (-40 to 176 °F), Standard, type MBG2000</li> </ul>	DK9CM - 2 DK9CM - 3 DK9CM - 4 DK9CM - 5 DK9CM - 6 DK9CM - 7

## 8.3 Communication-specific accessories

Accessory	Description	Order code
HART Communicator Field Xpert SFX 100	Handheld terminal for remote configuration and for obtaining measured values via the 4 to 20 mA HART current output. Contact your Endress+Hauser representative for more information.	SFX100 – *****
Fieldgate FXA320	Gateway for remote interrogation of HART sensors and actuators via Web browser: <ul style="list-style-type: none"> <li>■ 2-channel analog input (4 to 20 mA)</li> <li>■ 4 binary inputs with event counter function and frequency measurement</li> <li>■ Communication via modem, Ethernet or GSM</li> <li>■ Visualization via Internet/Intranet in Web browser and/or WAP cellular phone</li> <li>■ Limit value monitoring with alarm by e-mail or SMS</li> <li>■ Synchronized time stamping of all measured values.</li> </ul>	FXA320 – *****
Fieldgate FXA520	Gateway for remote interrogation of HART sensors and actuators via Web browser: <ul style="list-style-type: none"> <li>■ Web server for remote monitoring of up to 30 measuring points</li> <li>■ Intrinsically safe version [EEx ia]IIC for applications in hazardous areas</li> <li>■ Communication via modem, Ethernet or GSM</li> <li>■ Visualization via Internet/Intranet in Web browser and/or WAP cellular phone</li> <li>■ Limit value monitoring with alarm by e-mail or SMS</li> <li>■ Synchronized time stamping of all measured values</li> <li>■ Remote diagnosis and remote configuration of connected HART devices</li> </ul>	FXA520 – ****
FXA195	The Commubox FXA195 connects intrinsically safe Smart transmitters with HART protocol to the USB port of a personal computer. This makes the remote operation of the transmitters possible with the aid of configuration programs (e.g. FieldCare). Power is supplied to the Commubox by means of the USB port	FXA195 – *

## 8.4 Service-specific accessories



Accessory	Description	Order code
Applicator	Software for selecting and configuring flowmeters. Applicator can be downloaded from the Internet or ordered on CD-ROM for installation on a local PC. Contact your Endress+Hauser representative for more information.	DXA80 – *
Fieldcheck	Tester/simulator for testing flowmeters in the field. When used in conjunction with the "FieldCare" software package, test results can be imported into a database, printed and used for official certification. Contact your Endress+Hauser representative for more information.	50098801
FieldCare	FieldCare is Endress+Hauser's FDT-based plant asset management tool. It can configure all intelligent field devices in your plant and supports you in the administration of these devices. Through the use of status information, it is also an easy but effective means of monitoring the status of these devices.	See product list on the Endress+Hauser website: <a href="http://www.endress.com">www.endress.com</a>
FXA291	Service interface of device to the PC for operation via FieldCare.	FXA291 – *
Memograph M graphic display recorder	The Memograph M graphic display recorder provides information on all relevant process variables: Measuring values are recorded reliably, limit values monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on an SD card or USB stick. The PC software package ReadWin® 2000, which is supplied as standard, is used for configuration, visualization and storage of the recorded data. The mathematics channels which are optionally available enable continuous monitoring of specific power consumption, boiler efficiency and other parameters which are important for efficient energy management.	RSG40-*****



## 9 Troubleshooting

### 9.1 Troubleshooting instructions

Always start troubleshooting with the checklist below, if faults occur after startup or during operation. This takes you directly (via various queries) to the cause of the problem and the appropriate remedial measures.


Check the display	
No display visible and no output signals present	<ol style="list-style-type: none"> <li>1. Check supply voltage → Terminal 1, 2</li> <li>2. Check device fuse → 58 85 to 250 V AC: 1 A slow-blow / 250 V 20 to 28 V AC and 11 to 40 V DC: 1.6 A slow-blow / 250 V</li> <li>3. Electronics defective → Order spare part → 55</li> </ol>
No display visible but output signals are present	<ol style="list-style-type: none"> <li>1. Check whether the ribbon-cable connector of the display module is correctly plugged into the amplifier board → 56</li> <li>2. Display module defective → Order spare part → 55</li> <li>3. Electronics defective → Order spare part → 55</li> </ol>
Display texts are in a foreign language.	Switch off power supply. Press and hold down the   keys simultaneously and switch on the measuring device again. The display text will appear in English (default) and is displayed at maximum contrast.
Measured value indicated, but no signal output at the current or pulse output.	Electronics PCB defective → Order spare part → 55
↓	
Diagnosis code on the display	
<p>The measuring device is monitored during commissioning and operation. The results are shown on the display in the form of diagnosis code messages. Diagnosis code messages help the user detect current conditions and errors. Depending on the diagnosis code displayed, it is then possible to service the measuring device.</p> <p>Depending on the diagnosis code, the behavior of the device can also be affected. Where permitted, the user has the option of deactivating alarms and defining them as notice messages.</p> <p>There are 4 categories of diagnosis code messages: F, C, S, and M:</p> <p><b>Category F (failure):</b> The device does not function as it should such that the measured values cannot be used. This also includes some process errors.</p> <p><b>Category C (function check):</b> The device is being serviced, assembled, configured or is in the simulation mode. The output signals do not correspond to the actual process values and thus cannot be used.</p> <p><b>Category S (outside specification):</b> One or more measured values (e.g. flow etc.) are outside the specified limit values that were specified at the factory or by the users themselves. Diagnosis messages of this category are also displayed during measuring device startup or during cleaning processes.</p> <p><b>Category M (maintenance):</b> The measuring signals are still valid but are affected by factors such as wear, corrosion or fouling.</p> <p>The diagnosis code messages are grouped as follows within the F, C, S and M Categories:  <b>No. 000 – 199:</b> Messages affecting the sensor.  <b>No. 200 – 399:</b> Messages affecting the transmitter.  <b>No. 400 – 599:</b> Configuration-related messages (simulation, download, data storage etc.)  <b>No. 800 – 999:</b> Process-specific messages</p>	
↓	
Other errors (without error messages)	
Some other error has occurred.	Diagnosis and remedial measures → 53

## 9.2 Diagnosis code messages


### 9.2.1 Category F diagnosis code messages

Code on local display	Cause	Remedy (Spare parts → 55)	Device behavior: factory setting ( ) = options
F 001 Device fault	Serious device error	Replace the amplifier board.	Alarm (-)
F 062 Sensor connection	Connection between "down" sensor and transmitter interrupted.	<ul style="list-style-type: none"> <li>- Check the cable connection between the sensor and the transmitter.</li> <li>- Check that the sensor connector is fully screwed in</li> <li>- The sensor may be defective.</li> <li>- Incorrect sensor connected</li> <li>- A wrong sensor was selected in the function SENSOR TYPE.</li> </ul>	Alarm (-)
	Connection between "up" sensor and transmitter interrupted.		
F 282 Data storage	Faulty EEPROM	Replace printed circuit board.	Alarm (-)
F 283 Memory contents	Error accessing EEPROM data	Replace printed circuit board.	Alarm (-)
F 412 Writing backup	DAT transmitter: Data back-up (download) to T-DAT failed or error when accessing (uploading) the values saved in the T-DAT.	<ol style="list-style-type: none"> <li>1. Check whether the T-DAT is correctly plugged into the amplifier board → 35.</li> <li>2. Replace T-DAT if defective. Before replacing a DAT, check whether the new replacement DAT is compatible with the existing electronics. Check the: <ul style="list-style-type: none"> <li>- Spare part set number</li> <li>- Hardware revision code</li> </ul> </li> <li>3. Replace electronics boards if necessary.</li> </ol>	Notice (-)
F 413 Reading backup			Alarm (-)
F 881 Sensor signal	Attenuation of acoustic measurement section too high.	<ul style="list-style-type: none"> <li>- Check to see if the coupling fluid must be renewed.</li> <li>- It is possible that the fluid indicates too much attenuation.</li> <li>- It is possible that the pipe indicates too much attenuation.</li> <li>- Check the sensor spacing (Installation dimensions).</li> <li>- Reduce the number of traverses if possible.</li> </ul>	Alarm (-)






## 9.2.2 Category C diagnosis code messages

Code on local display	Cause	Remedy (Spare parts → 55)	Device behavior: factory setting ( ) = options
C 281 Initialization	Initialization is running. All outputs are set to 0.	Wait until the procedure is finished.	Notice (-)
C 284 Software update	Loading new software version. Currently no other functions are possible.	Wait until the procedure is finished. The device will restart automatically.	Alarm (-)
C 411 Upload/download	Up- or downloading the device data via configuration program. Currently no other functions are possible.	Wait until the procedure is finished.	Notice (-)
C 431 Calibration	Static zero point adjustment is not possible or was canceled.	Check that the flow velocity is = 0 m/s.	Alarm (-)
C 453 Hide value	Positive zero return active.  Caution! This is the highest priority notice message.	Switch off positive zero return.	Notice (-)
C 461 Signal output	Current adjustment is active.	End current adjustment.	Alarm (-)
C 481 Diagnosis active	The measuring device is being checked on site via the test and simulation device.	–	Notice (-)
C 482 Simulation outp.	Simulation current output active	Switch off simulation	Notice (-)
	Simulation frequency output active		
	Simulation pulse output active		
	Simulation status output active		
C 484 Simulation error	Simulation of response to error (outputs) active	Switch off simulation	Alarm (-)
C 485 Simulation value	Simulation of volume flow active	Switch off simulation	Notice (-)

### 9.2.3 Category S diagnosis code messages

Code on local display	Cause	Remedy (Spare parts → 55)	Device behavior: factory setting ( ) = options
S 437 Configuration	The sound velocity is outside the search range of the transmitter.	<ul style="list-style-type: none"> <li>– Check the installation dimensions.</li> <li>– If possible, check the sound velocity of the fluid or check the specialist literature.</li> </ul> <p>If the actual sound velocity is outside the defined search range, the corresponding parameters must be changed in the LIQUID DATA function group.</p> <p>More detailed information on this is provided in the SOUND VELOCITY LIQUID function (→ 91).</p>	Notice (–)
	<p>The pipe transmitted wave may superpose the signal. We recommend you alter the sensor configuration in the event of this error message.</p> <p> <b>Caution!</b> A change of the sensor configuration is required if the measuring device indicates zero or low flow.</p>	<ul style="list-style-type: none"> <li>– In the SENSOR CONFIGURATION function, change the number of traverses from 2 or 4 to 1 or 3 and mount the sensors accordingly.</li> </ul>	
S 461 Signal output	Current output: The current flow is outside the set range.	<ul style="list-style-type: none"> <li>– Change the upper or lower limit setting, as applicable.</li> <li>– Increase or reduce flow, as applicable.</li> </ul>	Notice (–)
	Pulse output: Pulse output frequency is out of range.	<ol style="list-style-type: none"> <li>1. Increase the setting for pulse weighting.</li> <li>2. When entering the pulse width, select a value that can still be processed by an external totalizer (e.g. mechanical totalizer, PLC, etc.).</li> </ol> <p><i>Determine the pulse width:</i></p> <ul style="list-style-type: none"> <li>– Version 1: Enter the minimum duration that a pulse must be present at the connected counter to ensure its registration.</li> <li>– Version 2: Enter the maximum (pulse) frequency as the half "reciprocal value" that a pulse must be present at the connected counter to ensure its registration.</li> </ul> <p>Example: The maximum input frequency of the connected totalizer is 10 Hz. The pulse width to be entered is:</p> $\frac{1}{2 \cdot 10 \text{ Hz}} = 50 \text{ ms}$ <ol style="list-style-type: none"> <li>3. Reduce flow</li> </ol>	

### 9.3 Process errors without messages

Symptoms	Remedial measures
 <b>Note!</b> You may have to change or correct settings in certain functions in the matrix in order to rectify faults.	
Flow values are negative, even though the fluid is flowing forwards through the pipe.	<ol style="list-style-type: none"> <li>1. Check wiring →  22. If necessary, reverse the connections at terminals "up" and "down".</li> <li>2. Change the setting in the "INSTALLATION DIRECTION, SENSOR" function accordingly</li> </ol>
Measured value reading fluctuates even though flow is steady.	<ol style="list-style-type: none"> <li>1. Check the fluid for presence of gas bubbles.</li> <li>2. "TIME CONSTANT" function (current output) → Increase value</li> <li>3. "FLOW DAMPING" function (system parameter) → Increase value</li> </ol>
There are differences between the flowmeter's internal totalizer and the external metering device.	This symptom is due primarily to backflow in the piping, because the pulse output cannot subtract in the "STANDARD or SYMMETRY" measuring modes.
Measured value reading shown on display, even though the fluid is at a standstill and the measuring tube is full.	<ol style="list-style-type: none"> <li>1. Check the fluid for presence of gas bubbles.</li> <li>2. Activate the "ON-VALUE LOW FLOW CUT OFF" function, i.e. enter or increase the value for the switching point.</li> </ol>
The current output signal is always 4 mA, irrespective of the flow signal at any given time.	<ol style="list-style-type: none"> <li>1. Set the "FIELD BUS ADDRESS" function to "0".</li> <li>2. Low flow too high. Reduce value in the "ON-VALUE LOW FLOW CUT OFF" function.</li> </ol>
The fault cannot be rectified or some other fault not described above has occurred.  In these instances, please contact your Endress+Hauser service organization.	<p>The following options are available for tackling problems of this nature:</p> <p><b>Request the services of an Endress+Hauser service technician</b>            If you contact our service organization to have a service technician sent out, please be ready with the following information:</p> <ul style="list-style-type: none"> <li>– Brief description of the fault</li> <li>– Nameplate specifications (→  7): ordering code and serial number</li> </ul> <p><b>Returning devices to Endress+Hauser</b>            The necessary procedures must be carried out before you return a flowmeter requiring repair or calibration to Endress+Hauser (→  59).            In all cases, enclose a fully completed "Declaration of contamination" form with the flowmeter. A copy of the "Dangerous Goods Sheet" can be found at the end of these Operating Instructions.</p> <p><b>Replace transmitter electronics</b>            Components in the electronics defective → Order spare part →  55.</p>

## 9.4 Response of outputs to errors



Note!

The response of the totalizer, current output, pulse output and status output is defined in the FAILSAFE MODE function (→ 99).

The outputs can be set to their fallback value by means of the positive zero return. Applicable when operation has to be interrupted while a pipe is being cleaned. This function takes priority over all other device functions; simulations, for example, are suppressed.

Failsafe mode of outputs and totalizers		
	Process/system error is present	Positive zero return is activated
Current output	<p><i>MINIMUM VALUE</i>            4–20 mA (25 mA) → 2 mA            4–20 mA NAMUR → 3.5 mA            4–20 mA US → 3.75 mA            4–20 mA (25 mA) HART → 2 mA            4–20 mA HART NAMUR → 3.5 mA            4–20 mA HART US → 3.75 mA</p> <p><i>MAXIMUM VALUE</i>            4–20 mA (25 mA) → 25 mA            4–20 mA NAMUR → 22.6 mA            4–20 mA US → 22.6 mA            4–20 mA (25 mA) HART → 25 mA            4–20 mA HART NAMUR → 22.6 mA            4–20 mA HART US → 22.6 mA</p> <p><i>ACTUAL VALUE</i>            Fault is ignored, i.e. standard measured value output on the basis of ongoing flow measurement (not recommended).</p>	Output signal corresponds to "zero flow"
Pulse output	<p>MINIMUM/MAXIMUM VALUE → FALLBACK VALUE            Signal output → No pulses</p> <p><i>ACTUAL VALUE</i>            Fault is ignored, i.e. standard measured value output on the basis of ongoing flow measurement.</p>	Output signal corresponds to "zero flow"
Totalizer	<p><i>MINIMUM/MAXIMUM VALUE</i> → STOP            The totalizer is paused until the fault is rectified.</p> <p><i>ACTUAL VALUE</i>            The fault is ignored. The totalizer continues to count in accordance with the current flow value.</p>	Totalizer stops
Status output	In the event of fault or power supply failure: status output → Non-conductive	No effect on status output

## 9.5 Spare parts

The previous sections contain a detailed troubleshooting guide → 49

The measuring device, more over, provides additional support in the form of continuous self-diagnosis and error messages.

Troubleshooting can entail replacing defective components with tested spare parts. The illustration below shows the available scope of spare parts.



**Note!**

You can order spare parts directly from your Endress+Hauser service organization by quoting the serial number printed on the transmitter nameplate → 7.

Spare parts are shipped as sets comprising the following parts:

- Spare part
- Additional parts, small items (screws, etc.)
- Mounting instructions
- Packaging

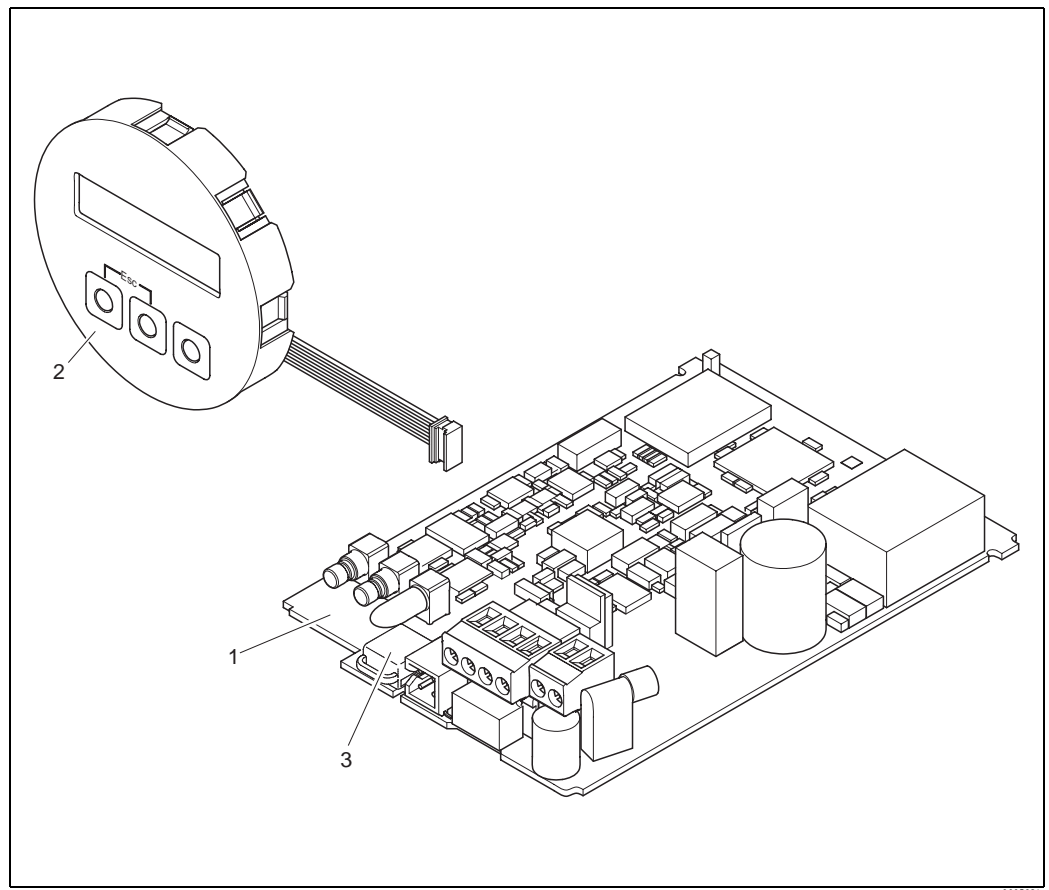


Fig. 34: Spare parts for Prosonic Flow 91 transmitter

- 1 Electronics board
- 2 Display module
- 3 HistoROM/T-DAT (transmitter-DAT)

## 9.6 Removing and installing electronics boards

### 9.6.1 Field housing: removing and installing electronics boards

→  35



Warning!

■ Risk of electric shock.

Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.

■ Risk of damaging electronic components (ESD protection). Static electricity can damage electronic components or impair their operability. Use a workplace with a grounded working surface, purpose-built for electrostatically sensitive devices!

■ If the dielectric strength of the device cannot be guaranteed maintained in the following steps, then an appropriate inspection must be carried out in accordance with the manufacturer's specifications.



Caution!

Use only genuine Endress+Hauser parts.

#### Commissioning a new electronics board:

1. Switch off power supply.
2. Unscrew cover of the electronics compartment from the transmitter housing.
3. Remove the local display (a) from the connection compartment cover.
4. Press the side latches (b) and flip down the cover of the connection compartment.
5. Disconnect the connector of the sensor cable (c).
6. Disconnect the connector for the power supply (d) and the outputs (e).
7. Disconnect the connector of the local display (f).
8. Release the screws of the board carrier (g).
9. Pull entire module (plastic retainer and electronics board) out of the housing.
10. Plug out the ground cable (h) of the electronics board.
11. Disconnect T-DAT.
12. Press the side latches (i) slightly outwards and partly push out the electronics board towards the rear from the front.
13. Remove the electronics board from the plastic retainer from the rear.
14. Installation is the reverse of the removal procedure.



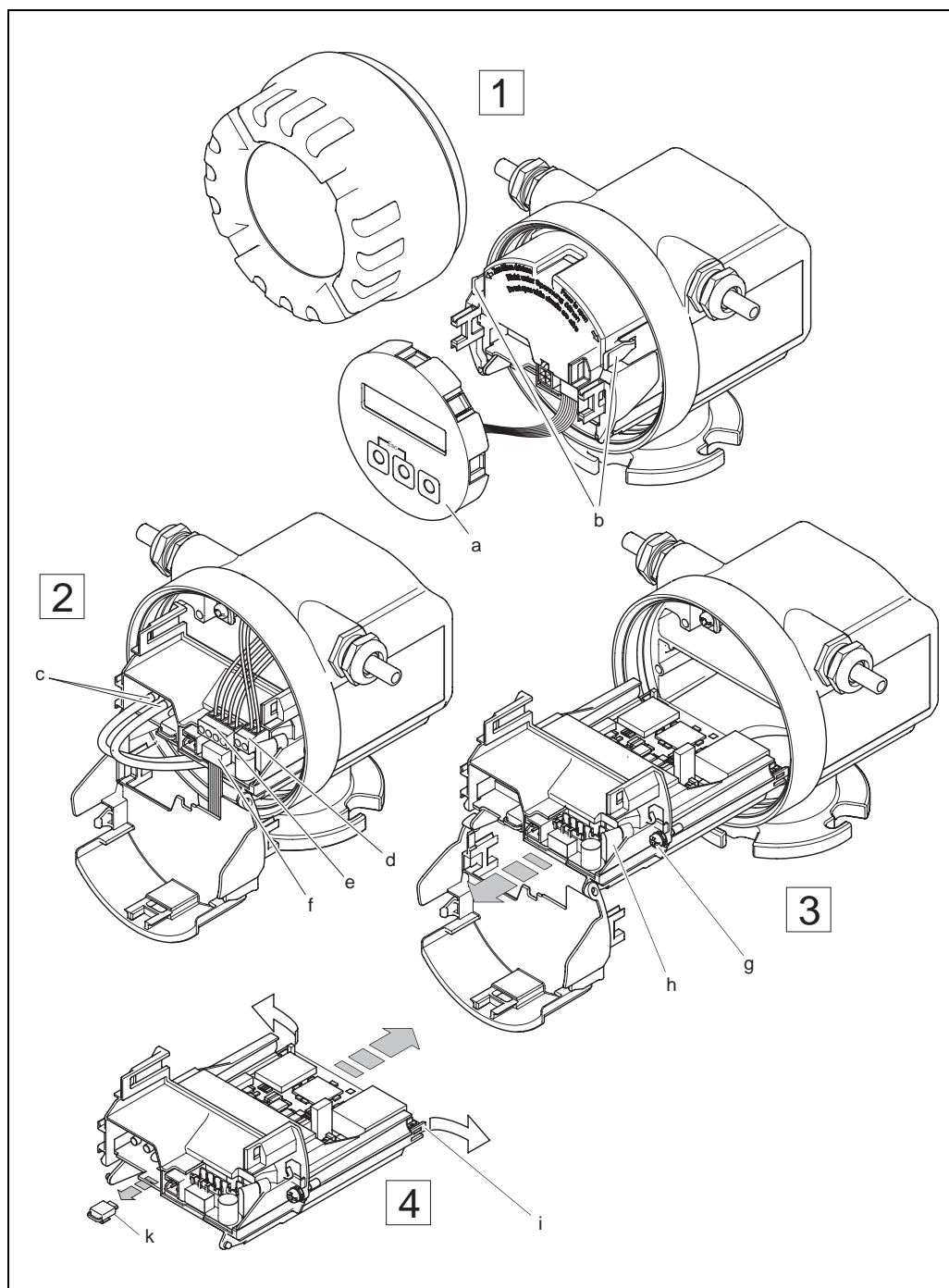


Fig. 35: Field housing: removing and installing electronics boards

- a Local display
- b Latches
- c Connectors for sensor cable
- d Connector for power supply
- e Connector for current output and pulse/status output
- f Connector of local display
- g Securing screws of the board carrier
- h Connector of the ground cable
- i Latches for the electronics board
- k T-DAT (transmitter-DAT)

## 9.7 Replacing the device fuse



**Warning!**

Risk of electric shock.

Exposed components carry dangerous voltages. Make sure that the power supply is switched off before you remove the cover of the electronics compartment.

The device fuse is located on the electronics board (→  36).

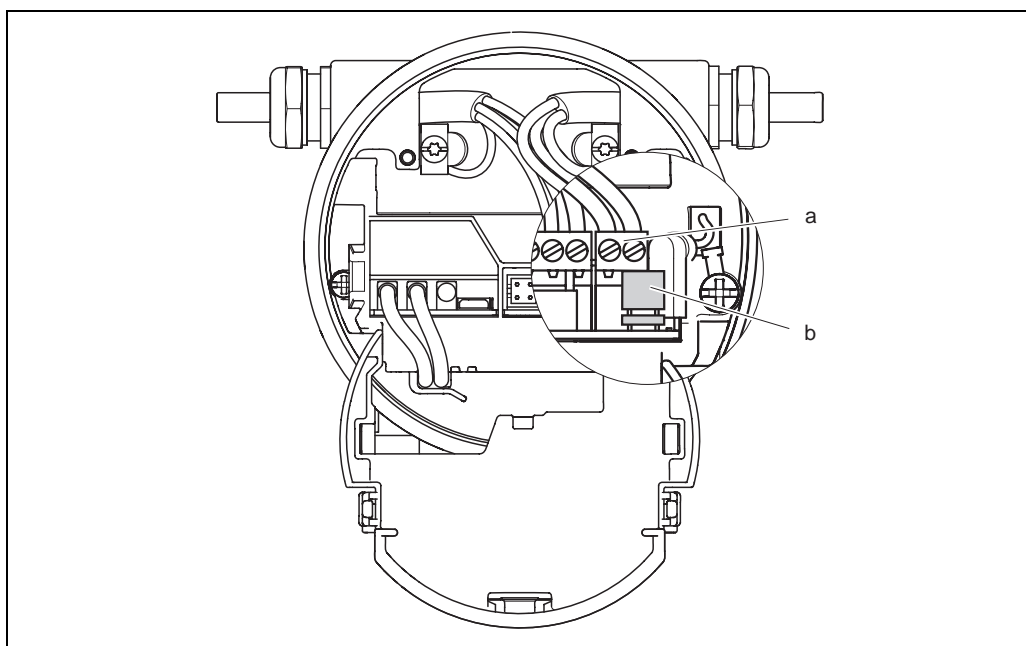
The procedure for replacing the fuse is as follows:

1. Switch off power supply.
2. Unscrew cover of the electronics compartment from the transmitter housing.
3. Press the side latches and flip down the cover of the connection compartment.
4. Remove the connector for the power supply (a).
5. Replace device fuse (b). Only use the following fuse type.  
Use only fuses of the following type:
  - Power supply 11 to 40 V DC / 20 to 28 V AC → 1.6 A slow-blow / 250 V TR5
  - Power supply 85 to 250 V AC → 1 A slow-blow / 250 V TR5
6. Installation is the reverse of the removal procedure.



**Caution!**

Use only genuine Endress+Hauser parts.



a0005832

Fig. 36: Replacing the device fuse on the electronics board

- a Connector for power supply  
b Device fuse

## 9.8 Return



### Caution!

Do not return a measuring device if you are not absolutely certain that all traces of hazardous substances have been removed, e.g. substances which have penetrated crevices or diffused through plastic.

Costs incurred for waste disposal and injury (burns, etc.) due to inadequate cleaning will be charged to the owner-operator.

The following steps must be taken before returning a flow measuring device to Endress+Hauser, e.g. for repair or calibration:

- Always enclose a duly completed "Declaration of contamination" form. Only then can Endress+Hauser transport, examine and repair a returned device.
- Enclose special handling instructions if necessary, for example a safety data sheet as per EC REACH Regulation No. 1907/2006.
- Remove all residues. Pay special attention to the grooves for seals and crevices which could contain residues. This is particularly important if the substance is hazardous to health, e.g. flammable, toxic, caustic, carcinogenic, etc.



### Note!

You will find a preprinted "Declaration of contamination" form at the back of these Operating Instructions.

## 9.9 Disposal

Observe the regulations applicable in your country!

## 9.10 Software history

Date	Software version	Changes to software	Operating Instructions
02.2010	V 1.01.XX	New Prosonic Flow W Sensor types	71109049/02.10
04.2006	V 1.00.00	Original software	71024989/04.06



### Note!

An upload or download between the individual software versions is only possible with a special service software.

## 10 Technical data

### 10.1 Technical data at a glance

#### 10.1.1 Application

- Measuring the flow rate of fluids in closed piping systems.
- Applications in measuring, control and regulation technology for monitoring processes.

#### 10.1.2 Function and system design

Measuring principle	Prosonic Flow operates on the principle of transit time difference.
Measuring system	<p>The measuring system consists of a transmitter and sensors.</p> <p>The following version is available: Version for installing in safe area</p> <p><b>Transmitter</b> Prosonic Flow 91</p> <p><b>Measuring sensors</b> Prosonic Flow W clamp-on version (water/wastewater applications) for nominal diameters DN 50 to 4000 (2" to 160")</p>

#### 10.1.3 Input

Measured variable	Flow velocity (transit time difference proportional to flow velocity)
Measuring range	Typically $v = 0$ to 15 (0 to 50 ft/s) with the specified measuring accuracy
Operable flow range	Over 150 : 1

### 10.1.4 Output

Output signal	<p><b>Current output</b></p> <ul style="list-style-type: none"> <li>■ Galvanically isolated</li> <li>■ Full scale value adjustable</li> <li>■ Temperature coefficient: typ. 2 <math>\mu\text{A}/^{\circ}\text{C}</math>, resolution: 1.5 <math>\mu\text{A}</math></li> <li>■ Active: 4 to 20 mA, <math>R_L &lt; 700 \Omega</math> (for HART: <math>R_L \geq 250 \Omega</math>)</li> </ul> <p><b>Pulse/status output:</b></p> <ul style="list-style-type: none"> <li>■ Galvanically isolated</li> <li>■ Open collector</li> <li>■ 30 V DC / 250 mA</li> <li>■ Passive</li> <li>■ Can be configured as:           <ul style="list-style-type: none"> <li>– <b>Pulse output:</b> pulse value and pulse polarity can be selected, max. pulse width adjustable (5 to 2000 ms), pulse frequency max. 100 Hz</li> <li>– <b>Status output:</b> for example, can be configured for error messages, empty pipe detection, flow recognition, limit value</li> </ul> </li> </ul>
Signal on alarm	<ul style="list-style-type: none"> <li>■ Current output, pulse output → Failsafe mode can be selected → 99</li> <li>■ Status output → "Not conductive" in the event of fault or power supply failure</li> </ul>
Load	See "Output signal"
Low flow cut off	Low flow cut off → Switch-on point can be selected as required
Galvanic isolation	All circuits for inputs, outputs and power supply are galvanically isolated from each other.

### 10.1.5 Power supply

Electrical connections	See → 22
Supply voltage (power supply)	<p><b>Transmitter</b></p> <p>85 to 250 V AC, 45 to 65 Hz          20 to 28 V AC, 45 to 65 Hz          11 to 40 V DC</p> <p><b>Sensor</b></p> <p>Powered by the transmitter</p>
Cable entry	<p><i>Power supply and signal cables (inputs/outputs):</i></p> <ul style="list-style-type: none"> <li>■ Cable entry M20 × 1.5 (8 to 12 mm; 0.31 to 0.47 in)</li> <li>■ Thread for cable entries 1/2" NPT, G 1/2"</li> </ul>
Cable specifications	See → 23
Power consumption	<p>85 to 250 V AC: &lt; 12 VA (incl. measuring sensor)</p> <p>20 to 28 V AC: &lt; 7 VA (incl. measuring sensor)</p> <p>11 to 40 V DC: &lt; 5 W (incl. measuring sensor)</p>
Power supply failure	<p>Lasting min. 1 power cycle.</p> <p>HistoROM/T-DAT save measuring system data if the power supply fails.</p>
Potential equalization	For potential equalization, no special measures are necessary.

### 10.1.6 Performance characteristics

#### Reference operating conditions

- Fluid temperature:  $+28\text{ °C} \pm 2\text{ K}$
- Ambient temperature:  $+22\text{ °C} \pm 2\text{ K}$
- Warm-up period: 30 minutes

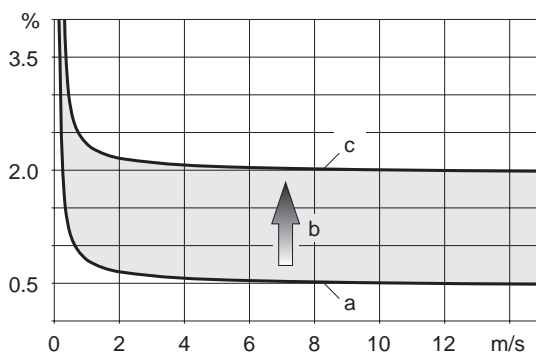
#### Installation:

- Inlet run  $>10 \times \text{DN}$
- Outlet run  $> 5 \times \text{DN}$
- Sensor and transmitter grounded.
- The measuring sensors are mounted correctly.

#### Maximum measured error

#### Measured error

The measured error depends on a number of factors. A distinction is made between the measured error of the device (Prosonic Flow 91 = 0.5 % of the measured value) and an additional installation-specific measured error (typically 1.5 % of the measured value) that is independent of the device. The installation-specific measured error depends on the installation conditions on site, such as the nominal diameter, wall thickness, real pipe geometry, fluid etc. The sum of the two measured errors is the measured error at the measuring point.



A0011347

Fig. 37: Example of the measured error in a pipe with a nominal diameter  $\text{DN} > 200$

- a Measured error of the device (0.5 % o.r.  $\pm$  0,02 % o.f.s.)  
 b Measured error due to installation conditions (typically 1.5 % o.r.)  
 c Measured error at the measuring point: 0.5 % o.r.  $\pm$  0,02 % o.f.s. + 1.5 % o.r. = 2 % o.r.  $\pm$  0,02 % o.f.s.

#### Measured error at the measuring point

The measured error at the measuring point is made up of the measured error of the device (0.5 % o.r.) and the measured error resulting from the installation conditions on site. Given a flow velocity  $> 0.3\text{ m/s}$  and a Reynolds number  $> 10000$ , the following are typical error limits:

Nominal diameter	Device error limits	+	Installation-specific error limits (typical)	→	Error limits at the measuring point (typical)
DN 50 to 200	$\pm 0.5\text{ \% o.r.} \pm 0.05\text{ \% o.f.s.}$	+	$\pm 1.5\text{ \% o.r.}$	→	$\pm 2\text{ \% o.r.} \pm 0.05\text{ \% o.f.s.}$
$> \text{DN } 200$	$\pm 0.5\text{ \% o.r.} \pm 0.05\text{ \% o.f.s.}$	+	$\pm 1.5\text{ \% o.r.}$	→	$\pm 2\text{ \% o.r.} \pm 0.02\text{ \% o.f.s.}$

o.r. = of reading

o.f.s. = of full scale value (15 m/s)

*Verification of Measurement Uncertainty*

If required, the device can be supplied with a verification of measurement uncertainty (measurement report). To certify the uncertainty of the device, a measurement is performed under reference conditions. Here, the sensors are mounted on a pipe with a nominal diameter of DN 100.

The verification of measurement uncertainty guarantees the following error limits of the device (at a flow velocity > 0.3 m/s and a Reynolds number > 10000):

Nominal diameter	Guaranteed error limits of the device
DN 100	$\pm 0.5\%$ o.r. $\pm 0.05\%$ o.f.s.

o.r. = of reading


o.f.s. = of full scale value (15 m/s)

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Repeatability	Max. $\pm 0.3\%$ for flow velocities > 0.3 m/s (0.98 ft/s)
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### 10.1.7 Operating conditions: Installation

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Installation instructions	Any orientation (vertical, horizontal) Restrictions and additional installation instructions →  11
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Inlet and outlet runs	Clamp-on version →  12
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Length of connecting cable	Shielded cables are offered in the following lengths: 5 m, 10 m, 15 m, 30 m, 60 m 15 feet, 30 feet, 45 feet, 90 feet, 180 feet
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Route the cable well clear of electrical machines and switching elements.

### 10.1.8 Operating conditions: Environment

Ambient temperature range	<i>Transmitter</i>
	–25 to +60 °C (–13 to +140 °F) Optional: –40 to +60 °C (–40 to +140 °F)
	At ambient temperatures below –20 °C (–4 °F) the readability of the display may be impaired. Install the transmitter at a shady location. Avoid direct sunlight, particularly in warm climatic regions.
	<i>Sensor Prosonic Flow W</i>
Storage temperature	–20 to +80 °C (–4 to +176 °F) Optional: 0 to +130 °C (–32 to +265 °F)
	It is permitted to insulate the sensors mounted on the pipe.
	<i>Connecting cable (sensor/transmitter)</i>
	Standard (PVC): –20 to +70 °C (–4 to +158 °F)
Degree of protection	The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors and the corresponding sensor cable (see above).
Shock and vibration resistance	<i>Transmitter</i>
	IP 67 (NEMA 4X)
	<i>Sensors</i>
	IP 67 (NEMA 4X) Optional: IP 68 (NEMA 6P)
Electromagnetic compatibility (EMC)	according to IEC 68-2-6
Medium temperature range	As per IEC/EN 61326 and NAMUR Recommendation NE 21.
	In the frequency operating range of the sensor (1 to 3 MHz), failsafe values up to 5 V do not affect the measured values.

### 10.1.9 Operating conditions: Process

Medium pressure range (nominal pressure)	Flowrate measuring sensors Prosonic Flow W (clamp-on):
	–20 to +80 °C (–4 to +176 °F)
	Optional: 0 to +130 °C (+32 to +266 °F)
Pressure loss	Perfect measurement requires that the static fluid pressure is higher than vapor pressure.
	There is no pressure loss.



### 10.1.10 Mechanical construction

Design, dimensions	The dimensions and lengths of the sensor and transmitter can be found in the "Technical Information" document for the device in question. This can be downloaded as a PDF file from <a href="http://www.endress.com">www.endress.com</a> . A list of the "Technical Information" documents available is provided in Section "Documentation" on → 66.
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Weight	<ul style="list-style-type: none"> <li>■ Transmitter housing: 2.4 kg (5.2 lb)</li> <li>■ Flowrate measuring sensors W (clamp-on) incl. mounting rail and tensioning bands: 2.8 kg (6.2 lb)</li> </ul>
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Materials	<p><i>Transmitter</i></p> <p>Wall-mounted housing: powder-coated die-cast aluminum</p> <p><i>Sensor</i></p> <p>Prosonic Flow W clamp-on version</p> <ul style="list-style-type: none"> <li>■ Sensor holder: stainless steel 1.4308/CF-8</li> <li>■ Sensor housing: stainless steel 1.4301/304</li> <li>■ Strapping bands/bracket: stainless steel 1.4301/304</li> <li>■ Sensor contact surfaces: chemically stable plastic</li> </ul> <p><i>Connecting cable (sensor/transmitter)</i></p> <ul style="list-style-type: none"> <li>■ PVC connecting cable <ul style="list-style-type: none"> <li>– Cable sheath: PVC</li> <li>– Cable connector: nicked brass 2.0401/C38500</li> </ul> </li> </ul>
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### 10.1.11 Human interface

Display elements	<ul style="list-style-type: none"> <li>■ Liquid crystal display: illuminated, two lines with 16 characters per line</li> <li>■ Custom configurations for presenting different measured value and status variables</li> <li>■ 1 totalizer</li> </ul>
Operating elements	Local operation via three operating keys (◀, +, ▶)
Remote operation	Operation via HART protocol and FieldCare
Languages	English, German, Spanish, Italian, French

### 10.1.12 Certificates and approvals

Ex approval	Information about currently available Ex versions (FM, CSA) can be supplied by your Endress+Hauser Sales Center on request. All explosion protection data are given in a separate documentation which is available upon request.
CE mark	The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
C-tick mark	The measuring system meets the EMC requirements of the Australian Communication and Media Authority (ACMA).
Other standards and guidelines	<ul style="list-style-type: none"> <li>■ EN 60529: Degrees of protection by housing (IP code).</li> <li>■ EN 61010-1 Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.</li> <li>■ IEC/EN 61326 "Emission in accordance with requirements for Class A". Electromagnetic compatibility (EMC requirements)</li> <li>■ ANSI/ISA-61010-1 (82.02.01) Safety Standard for Electrical and Electronic Test, Measuring, Controlling and related Equipment – General Requirements. Pollution degree 2.</li> <li>■ CAN/CSA-C22.2 No. 1010.1-92 Safety requirements for Electrical Equipment for Measurement and Control and Laboratory Use. Pollution degree 2, Installation Category II</li> <li>■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.</li> <li>■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.</li> <li>■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics.</li> </ul>

### 10.1.13 Ordering information

Your Endress+Hauser service organization can provide detailed ordering information and information on the order codes on request.

### 10.1.14 Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor →  46.

Your Endress+Hauser service organization can provide detailed information on the order codes in question.
































### 10.1.15 Documentation

- Flow Measurement (FA005D/06)
- Technical Information Prosonic Flow 91W (TI105D/06)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA




# 11 Description of device functions

## 11.1 Illustration of the function matrix

Function groups	Functions
MEASURING VALUES (→ ▢ 69)	VOLUME FLOW (→ ▢ 69)
SENSOR SETUP (→ ▢ 70)	SETUP (→ ▢ 70)
SYSTEM UNITS (→ ▢ 71)	UNIT VOLUME FLOW (→ ▢ 71)
OPERATION (→ ▢ 73)	LANGUAGE (→ ▢ 73)
USER INTERFACE (→ ▢ 75)	FORMAT (→ ▢ 75)
TOTALIZER (→ ▢ 76)	SUM (→ ▢ 76)
CURRENT OUTPUT (→ ▢ 77)	CURRENT RANGE (→ ▢ 77)
PULSE/STAT. OUT. (→ ▢ 79)	OPERATION MODE (→ ▢ 79)
	SWITCH-OFF POINT (→ ▢ 81)
COMMUNICATION (→ ▢ 84)	TAG NAME (→ ▢ 84)
PROCESS PARAMETER (→ ▢ 85)	ON-VAL. LF CUTOFF (→ ▢ 85)
PIPE DATA (→ ▢ 87)	PIPE MATERIAL (→ ▢ 87)
LINER (→ ▢ 89)	LINER MATERIAL (→ ▢ 89)
LIQUID DATA (→ ▢ 90)	LIQUID (→ ▢ 90)
	SOUND VELOCITY (→ ▢ 69)
	SOUND VELOCITY (→ ▢ 71)
	UNIT TEMPERATURE (→ ▢ 72)
	UNIT VELOCITY (→ ▢ 72)
	UNIT VISCOSITY (→ ▢ 72)
	UNIT LENGTH (→ ▢ 72)
	SIGNAL STRENGTH (→ ▢ 69)
	DEF.PRIVATE CODE (→ ▢ 73)
	T-DAT SAVE/LOAD (→ ▢ 74)
	TEST DISPLAY (→ ▢ 75)
	RESET TOTALIZ. (→ ▢ 76)
	TIME CONSTANT (→ ▢ 78)
	PULSE WIDTH (→ ▢ 79)
	OUTPUT SIGNAL (→ ▢ 80)
	ASSIGN STATUS (→ ▢ 80)
	SWITCH-ON POINT (→ ▢ 80)
	FIELD BUS ADDRESS (→ ▢ 84)
	WRITE PROTECT (→ ▢ 84)
	MANUFACTURER ID (→ ▢ 84)
	DEVICE ID (→ ▢ 84)
	ZERO POINT (→ ▢ 86)
	CIRCUMFERENCE (→ ▢ 87)
	PIPE DIAMETER (→ ▢ 87)
	WALL THICKNESS (→ ▢ 88)
	LINEAR THICKNESS (→ ▢ 89)
	TEMPERATURE (→ ▢ 90)
	SOUND VELOCITY LIQUID (→ ▢ 91)
	VISCOSITY (→ ▢ 91)
	SOUND VEL. NEG. (→ ▢ 91)
	SOUND VEL. POS. (→ ▢ 92)

Function groups		Functions					
CONFIG. CHANNEL (→  93)	▲	SENSOR TYPE (→  93)	SENSOR CONFIG. (→  93)	CABLE LENGTH (→  93)	POS.SENSOR (→  94)	WIRE LENGTH (→  94)	SENSOR DISTANCE (→  94)
CALIBRATION DATA (→  95)	▲	CAL. FACTOR (→  95)	ZERO POINT (→  95)	ZEROPOINT STAT. (→  95)	CORR. FACTOR (→  95)		
SYSTEM PARAMETER (→  96)	▲	INSTL. DIR. SENSOR (→  96)	MEASURING MODE (→  96)	POS. ZERO RETURN (→  98)	FLOW DAMPING (→  98)		
SUPERVISION (→  99)	▲	FAILSAFE MODE (→  99)	ACTUAL SYS. COND (→  99)	PREV. SYST. COND (→  99)	ALARM DELAY (→  100)	SYSTEM RESET (→  100)	
SIMULATION SYSTEM (→  101)	▲	SIM. FAILSAFE (→  101)	SIM. MEASURAND (→  101)	VALUE SIM. MEAS. (→  101)			
SENSOR VERSION (→  102)	▲	SERIAL NUMBER (→  102)					
AMPLIFIER VERSION (→  102)	▲	SOFTW. REV. NO. (→  102)					

## 11.2 Group MEASURING VALUES



Functional description MEASURING VALUES	
<p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ The engineering unit of the measured variable displayed here can be set in the SYSTEM UNITS group, (→  71).</li> <li>■ If the fluid in the pipe flows backwards, a negative sign prefixes the flow reading on the display.</li> </ul>	
<b>VOLUME FLOW</b>	<p>The volume flow currently measured appears on the display.</p> <p><b>Display:</b> 5-digit floating-point number, including unit and sign (e.g. 5.5445 dm<sup>3</sup>/min; 1.4359 m<sup>3</sup>/h; -731.63 gal/d; etc.)</p>
<b>SOUND VELOCITY</b>	<p>The current measured sound velocity in the liquid appears on the display.</p> <p><b>Display:</b> 5-digit fixed-point number, incl. unit (e.g. 1400.0 m/s, 5249.3 ft/s)</p>
<b>FLOW VELOCITY</b>	<p>The flow velocity currently measured appears on the display.</p> <p><b>Display:</b> 5-digit floating-point number, including unit and sign (e.g. 8.0000 m/s, 26.247 ft/s)</p>
<b>SIGNAL STRENGTH</b>	<p>The signal strength appears on the display.</p> <p><b>Display:</b> 4-digit fixed-point number (e.g. 80.0 dB)</p> <p> <b>Note!</b> To ensure reliable measurement takes place, Prosonic Flow requires a signal strength of &gt; 30 dB.</p>

## 11.3 Group SENSOR SETUP

Functional description SENSOR SETUP	
<b>SETUP</b>	<p>Picklist SENSOR SETUP:</p> <ul style="list-style-type: none"> <li>■ SETUP</li> <li>■ LIQUID</li> <li>■ PIPE DATA</li> <li>■ LINER</li> <li>■ CONFIG. CHANNEL</li> <li>■ POS. SENSOR</li> <li>■ QUIT</li> </ul> <p>SETUP: LIQUID → TEMPERATURE → SOUND VEL. LIQUID → PIPE MATERIAL → SOUND VEL. PIPE → CIRCUMFERENCE → PIPE DIAMETER → WALL THICKNESS → LINER MATERIAL → SOUND VEL. LINER → LINER THICKNESS → SENSOR TYPE → SENSOR CONFIG. → CABLE LENGTH → POS.SENSOR/WIRE LENGTH → SENSOR DISTANCE</p> <p>LIQUID:LIQUID → TEMPERATURE → SOUND VEL. LIQUID</p> <p>PIPE DATA:PIPE MATERIAL → SOUND VEL.PIPE → CIRCUMFERENCE → PIPE DIAMETER → WALL THICKNESS</p> <p>LINER:LINER MATERIAL → SOUND VEL. LINER → LINER THICKNESS</p> <p>CONFIG. CHANNEL:SENSOR TYPE → SENSOR CONFIG. → CABLE LENGTH</p> <p>POS.SENSOR:POS.SENSOR/WIRE LENGTH → SENSOR DISTANCE</p> <p>The following information is required for a successful setup:</p> <ul style="list-style-type: none"> <li>■ Sound velocity of the liquid</li> <li>■ Operating temperature</li> <li>■ Pipe circumference or pipe outer diameter</li> <li>■ Sound velocity of the pipe material</li> <li>■ Wall thickness</li> <li>■ Sound velocity of the lining material (if present)</li> <li>■ Thickness of the lining (if present)</li> <li>■ Sensor type</li> <li>■ Sensor arrangement (direct or reflection mode)</li> <li>■ Length of the sensor cable</li> </ul> <p>The relative sensor positions and the proportionality factor (meter factor) are determined from these application-specific data.</p> <p>The functionality of the device is ensured by correctly specifying the sound velocity of the liquid, the nominal diameter of the pipe, the sensor type and the sensor arrangement, provided the unit is mounted correctly.</p> <p>The correct information for the sensor cable length and the wall and liner thickness primarily affect the quality of the measurement.</p>







## 11.4 Group SYSTEM UNITS


Functional description SYSTEM UNITS	
Use this function group to select the unit required and displayed for the measured variable.	
<b>UNIT VOLUME FLOW</b>	<p>Use this function to select the unit for displaying the volume flow.</p> <p>The unit you select here is also valid for:</p> <ul style="list-style-type: none"> <li>■ Volume flow display</li> <li>■ Current output</li> <li>■ Switch points (limit value for volume flow, flow direction)</li> <li>■ Low flow</li> </ul> <p><b>Options:</b></p> <p>Metric:</p> <p>Cubic centimeter → cm<sup>3</sup>/s; cm<sup>3</sup>/min; cm<sup>3</sup>/h; cm<sup>3</sup>/day</p> <p>Cubic decimeter → dm<sup>3</sup>/s; dm<sup>3</sup>/min; dm<sup>3</sup>/h; dm<sup>3</sup>/day</p> <p>Cubic meter → m<sup>3</sup>/s; m<sup>3</sup>/min; m<sup>3</sup>/h; m<sup>3</sup>/day</p> <p>Milliliter → ml/s; ml/min; ml/h; ml/day</p> <p>Liter → l/s; l/min; l/h; l/day</p> <p>Hectoliter → hl/s; hl/min; hl/h; hl/day</p> <p>Megaliter → Ml/s; Ml/min; Ml/h; Ml/day</p> <p>US:</p> <p>Cubic centimeter → cc/s; cc/min; cc/h; cc/day</p> <p>Acre foot → af/s; af/min; af/h; af/day</p> <p>Cubic foot → ft<sup>3</sup>/s; ft<sup>3</sup>/min; ft<sup>3</sup>/h; ft<sup>3</sup>/day</p> <p>Fluid ounce → oz f/s; oz f/min; oz f/h; oz f/day</p> <p>Gallon → gal/s; gal/min; gal/h; gal/day</p> <p>Kilo gallons → Kgal/s; Kgal/min; Kgal/h; Kgal/day</p> <p>Million gallons → Mgal/s; Mgal/min; Mgal/h; Mgal/day</p> <p>Barrel (normal fluids: 31.5 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day</p> <p>Barrel (beer: 31.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day</p> <p>Barrel (petrochemicals: 42.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day</p> <p>Barrel (filling tanks: 55.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day</p> <p>Imperial:</p> <p>Gallon → gal/s; gal/min; gal/h; gal/day</p> <p>Mega gallon → Mgal/s; Mgal/min; Mgal/h; Mgal/day</p> <p>Barrel (beer: 36.0 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day</p> <p>Barrel (petrochemicals: 34.97 gal/bbl) → bbl/s; bbl/min; bbl/h; bbl/day</p> <p><b>Factory setting:</b></p> <p>Depends on nominal diameter and country (dm<sup>3</sup>/min to m<sup>3</sup>/h or US-gal/min), corresponding to the full scale value unit factory setting → 103</p>
<b>UNIT VOLUME</b>	<p>Use this function to select the unit for displaying the volume.</p> <p>The unit you select here is also valid for:</p> <ul style="list-style-type: none"> <li>■ Totalizer status display</li> <li>■ Unit totalizer</li> <li>■ Pulse value (e.g. m<sup>3</sup>/p)</li> </ul> <p><b>Options:</b></p> <p>Metric → cm<sup>3</sup>; dm<sup>3</sup>; m<sup>3</sup>; ml; l; hl; Ml</p> <p>US → cc; af; ft<sup>3</sup>; oz f; gal; Kgal; Mgal; bbl (normal fluids); bbl (beer); bbl (petrochemicals); bbl (filling tanks)</p> <p>Imperial → gal; Mgal; bbl (beer); bbl (petrochemicals)</p> <p><b>Factory setting:</b></p> <p>Depends on nominal diameter and country (dm<sup>3</sup> to m<sup>3</sup> or US-gal), corresponds to the totalizer unit factory setting → 103</p>

Functional description SYSTEM UNITS	
<b>UNIT TEMPERATURE</b>	<p>Use this function to select the unit for the liquid temperature.</p> <p> Note! The liquid temperature is entered in the function TEMPERATURE (→  90).</p> <p><b>Options:</b> °C (Celsius) K (Kelvin) °F (Fahrenheit) °R (Rankine)</p> <p><b>Factory setting:</b> °C</p>
<b>UNIT VELOCITY</b>	<p>Use this function to select the unit for velocity.</p> <p>The unit you select here is also valid for:</p> <ul style="list-style-type: none"> <li>■ Sound velocity</li> <li>■ Flow velocity</li> </ul> <p><b>Options:</b> m/s ft/s</p> <p><b>Factory setting:</b> m/s</p>
<b>UNIT VISCOSITY</b>	<p>Use this function to select the unit for liquid viscosity.</p> <p><b>Options:</b> mm<sup>2</sup>/s cSt St</p> <p><b>Factory setting:</b> mm<sup>2</sup>/s</p>
<b>UNIT LENGTH</b>	<p>Use this function to select the unit for the measure of length.</p> <p>The unit you select here is also valid for:</p> <ul style="list-style-type: none"> <li>■ Nominal diameter</li> <li>■ Diameter</li> <li>■ Wall thickness</li> <li>■ Liner thickness</li> <li>■ Wire length</li> <li>■ Sensor distance</li> </ul> <p><b>Options:</b> MILLIMETER INCH</p> <p><b>Factory setting:</b> MILLIMETER</p>




## 11.5 Group OPERATION





Functional description OPERATION	
<b>LANGUAGE</b>	<p>Use this function to select the language for all texts, parameters and messages shown on the local display.</p> <p><b>Options:</b>            ENGLISH            DEUTSCH            FRANCAIS            ESPANOL            ITALIANO</p> <p><b>Factory setting:</b>            Depends on country, see factory setting → 103 ff.</p> <p> <b>Note!</b>            If you press the   keys simultaneously at startup, the language defaults to "ENGLISH".</p>
<b>ACCESS CODE</b>	<p>All data of the measuring system are protected against inadvertent change. Programming is disabled and the settings cannot be changed until a code is entered in this function. If you press the  keys in any function, the measuring system automatically goes to this function and the prompt to enter the code appears on the display (when programming is disabled).</p> <p>You can activate programming by entering your private code (<b>factory setting = 91</b>, see also the subsequent DEFINE PRIVATE CODE function)</p> <p><b>User input:</b>            Max. 4-digit number: 0 to 9999</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ The programming levels are disabled if you do not press a key within 60 seconds following automatic return to the HOME position.</li> <li>■ You can also disable programming in this function by entering any number (other than the defined private code).</li> <li>■ The Endress+Hauser service organization can be of assistance if you mislay your personal code.</li> </ul>
<b>DEF.PRIVATE CODE</b>	<p>Use this function to enter a personal code to enable programming.</p> <p><b>User input:</b>            0 to 9999 (max. 4-digit number)</p> <p><b>Factory setting:</b>            91</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ This function only appears if the private code was entered in the ACCESS CODE function.</li> <li>■ Programming is always enabled with the code "0".</li> <li>■ Programming has to be enabled before this code can be changed.            When programming is disabled this function is not available, thus preventing others from accessing your personal code.</li> </ul>

Functional description OPERATION	
T-DAT SAVE/LOAD	<p>In this function, the configuration/settings of the <b>transmitter</b> can be saved to a transmitter DAT (T-DAT) or uploading a configuration from the T-DAT to the EEPROM can be activated (<b>manual</b> back-up function).</p> <p>Application examples:</p> <ul style="list-style-type: none"><li>■ After commissioning, the current measuring point parameters can be saved to the T-DAT (backup).</li><li>■ When exchanging the transmitter, the data can be loaded from the T-DAT to the new transmitter (EEPROM).</li></ul> <p><b>Options:</b> CANCEL SAVE (from EEPROM to T-DAT) LOAD (from the T-DAT to the EEPROM)</p> <p><b>Factory setting:</b> CANCEL</p> <p> Note!</p> <ul style="list-style-type: none"><li>■ If the target device has an older software version, the message "TRANSM. SWDAT" is displayed during startup. Then only the SAVE function is available.</li><li>■ <b>LOAD</b> This function is only possible if the target device has the same software version as, or a more recent software version than, the source device.</li><li>■ <b>SAVE</b> This function is always available.</li></ul>

## 11.6 Group USER INTERFACE

Functional description USER INTERFACE	
<b>FORMAT</b>	<p>Use this function to define the maximum number of places after the decimal point displayed for the reading in the main line.</p> <p><b>Options:</b>          XXXXX.          XXXX.X          XXX.XX          XX.XXX          X.XXXX</p> <p><b>Factory setting:</b>          X.XXXX</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ Note that this setting only affects the reading as it appears on the display, it has no influence on the accuracy of the system's calculations.</li> <li>■ The places after the decimal point as computed by the measuring device cannot always be displayed, depending on this setting and the engineering unit. In such instances an arrow appears on the display between the measuring value and the engineering unit (e.g. 1.2 → l/h), indicating that the measuring system is computing with more decimal places than can be shown on the display.</li> </ul>
<b>CONTRAST LCD</b>	<p>Use this function to optimize display contrast to suit local operating conditions.</p> <p><b>User input:</b>          10 to 100%</p> <p><b>Factory setting:</b>          50%</p>
<b>TEST DISPLAY</b>	<p>Use this function to test the operability of the local display and its pixels.</p> <p><b>Options:</b>          OFF          ON</p> <p><b>Factory setting:</b>          OFF</p> <p><b>Test sequence:</b></p> <ol style="list-style-type: none"> <li>1. Start the test by selecting ON.</li> <li>2. All pixels of the main line and additional line are darkened for at least 0.75 seconds.</li> <li>3. The main line and additional line show an "8" in each field for at least 0.75 seconds.</li> <li>4. The main line and additional line show a "0" in each field for at least 0.75 seconds.</li> <li>5. The main line and additional line show nothing (blank display) for at least 0.75 seconds.</li> </ol> <p>When the test completes the local display returns to its initial state and the setting changes to "OFF".</p>

## 11.7 Group TOTALIZER

Functional description TOTALIZER	
<b>SUM</b>	<p>The total for the totalizer's measured variable aggregated since measuring commenced appears on the display.</p> <p>This value can be positive or negative, depending on:</p> <ul style="list-style-type: none"> <li>■ Flow direction and/or</li> <li>■ Setting in the MEASURING MODE function →  96</li> </ul> <p><b>Display:</b> Max. 6-digit floating-point number, incl. sign and unit (e.g. 15467.4 m<sup>3</sup>)</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ The totalizer's response to faults is defined in the central "FAILSAFE MODE" function →  99.</li> <li>■ The unit of the totalizer is defined in the UNIT VOLUME function →  71.</li> </ul>
<b>OVERFLOW</b>	<p>The total for the totalizer's overflow aggregated since measuring commenced appears on the display.</p> <p>Total flow quantity is represented by a floating-point number consisting of max. 6 digits. You can use this function to view higher numerical values (&gt;9,999,999) as overflows. The effective quantity is thus the total of the OVERFLOW function plus the value displayed in the SUM function.</p> <p><b>Example:</b> Reading for 2 overflows: 2 E7 dm<sup>3</sup> (= 20,000,000 dm<sup>3</sup>) The value displayed in the function "SUM" = 196,845 dm<sup>3</sup> Effective total quantity = 20,196,845 dm<sup>3</sup></p> <p><b>Display:</b> Integer with exponent, including sign and unit, e.g. 2 E7 dm<sup>3</sup></p>
<b>RESET TOTALIZER</b>	<p>Use this function to reset the sum and the overflow of the totalizer to "zero" (= RESET).</p> <p><b>Options:</b> NO YES</p> <p><b>Factory setting:</b> NO</p>

## 11.8 Group CURRENT OUTPUT

### Functional description CURRENT OUTPUT


**Note!**

The functions of the CURRENT OUTPUT group are only available if the "0" value was entered in the BUS ADDRESS function → 84.

**CURRENT RANGE**

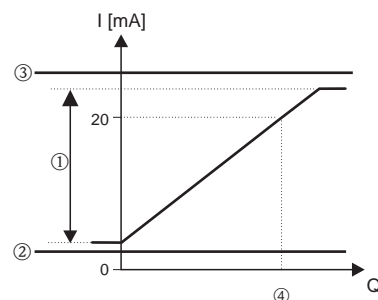
Use this function to specify the current range. You can configure the current output either in accordance with the NAMUR recommendation (max. 20.5 mA) or for a maximum drive of 25 mA.

**Options:**

OFF  
 4-20 mA (25 mA)  
 4-20 mA (25 mA) HART  
 4-20 mA NAMUR  
 4-20 mA HART NAMUR  
 4-20 mA US  
 4-20 mA HART US

**Factory setting:**

4-20 mA (25 mA) HART NAMUR

**Current span, operational range and signal on alarm level**


A	①	②	③
OFF	4 mA	-	-
4-20 mA (25 mA)	4 - 24 mA	2	25
4-20 mA (25 mA) HART	4 - 24 mA	2	25
4-20 mA NAMUR	3,8 - 20,5 mA	3,5	22,6
4-20 mA HART NAMUR	3,8 - 20,5 mA	3,5	22,6
4-20 mA US	3,9 - 20,8 mA	3,75	22,6
4-20 mA HART US	3,9 - 20,8 mA	3,75	22,6

a0005392

A = Work range

① = Work range

② = Lower signal on alarm level





③ = Upper signal on alarm level

④ = Scaled full scale value






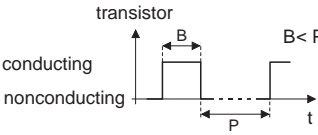
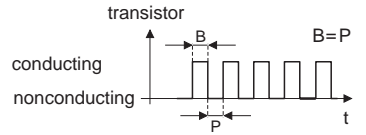




Q = Flow







**Note!**

- If the measured value is outside the measuring range (defined in the VALUE 20 mA function → 78), a notice message is generated.
- The current output's response to faults is defined in the central FAILSAFE MODE function → 99.



Functional description CURRENT OUTPUT	
<b>VALUE 20 mA</b>	<p>Use this function to assign the 20 mA current a full scale value. Positive and negative values are permissible. The required measuring range is defined by defining the VALUE 20 mA .</p> <p>In the SYMMETRY measuring mode →  96, the value assigned applies to both flow directions; in the STANDARD measuring mode it applies only to the flow direction selected.</p> <p><b>User input:</b> 5-digit floating-point number, with sign</p> <p><b>Factory setting:</b> Depends on nominal diameter and country, [value] / / [dm<sup>3</sup> to m<sup>3</sup> or US-gal to US-Mgal] Corresponds to the factory setting for the full scale value →  103.</p> <p> Note!</p> <ul style="list-style-type: none"> <li>■ The appropriate unit is taken from the SYSTEM UNITS group →  71.</li> <li>■ The value for 4 mA always corresponds to the zero flow (0 [unit]). This value is fixed and cannot be edited.</li> </ul>
<b>TIME CONSTANT</b>	<p>Use this function to enter a time constant defining how the current output signal reacts to severely fluctuating measured variables, either very quickly (enter a low time constant) or with damping (enter a high time constant).</p> <p><b>User input:</b> Fixed point number 0.01 to 100.00 s</p> <p><b>Factory setting:</b> 1.00 s</p>

## 11.9 Group PULSE/STATUS OUTPUT

Functional description PULSE/STATUS OUTPUT	
<b>OPERATION MODE</b>	<p>Configuration of the output as a pulse or status output. The functions available in this function group vary, depending on which option you select here.</p> <p><b>Options:</b> OFF PULSE STATUS</p> <p><b>Factory setting:</b> PULSE</p>
<b>PULSE VALUE</b>	<p> <b>Note!</b> This function is not available unless the PULSE setting was selected in the OPERATING MODE function.</p> <p>Use this function to define the flow at which a pulse is triggered. These pulses can be totaled by an external totalizer and the total flow since measuring started can be recorded in this way.</p> <p>In the SYMMETRY measuring mode →  96, the value assigned applies to both flow directions; in the STANDARD measuring mode it applies only to the positive flow direction.</p> <p><b>User input:</b> 5-digit floating-point number, [unit]</p> <p><b>Factory setting:</b> Depends on nominal diameter and country, [value] [dm<sup>3</sup> to m<sup>3</sup> or US-gal] / pulse; Corresponds to the factory setting for the pulse value →  103.</p> <p> <b>Note!</b> The appropriate unit is taken from the SYSTEM UNITS group.</p>
<b>PULSE WIDTH</b>	<p> <b>Note!</b> This function is not available unless the PULSE setting was selected in the OPERATING MODE function.</p> <p>Use this function to enter the maximum pulse width of the output pulses.</p> <p><b>User input:</b> 5 to 2000 ms</p> <p><b>Factory setting:</b> 100 ms</p> <p>Pulse output is always with the pulse width (B) entered in this function. The pauses (P) between the individual pulses are automatically configured. However, they must at least correspond to the pulse width (B = P).</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p><math>B &lt; P</math></p> </div> <div style="text-align: center;">  <p><math>B = P</math></p> </div> </div> <p>P = Intervals between the individual pulses B = Pulse width entered (the illustration applies to positive pulses)</p> <p> <b>Caution!</b> Buffering (pulse memory) takes place if the number of pulses is too large to output the pulses with the selected pulse width (see PULSE VALUE function on →  79). The system error message RANGE PULSE is displayed if more pulses are in the pulse memory than can be output in 4 seconds.</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ When entering the pulse width, select a value that can still be processed by an external totalizer (e.g. mechanical totalizer, PLC, etc.).</li> <li>■ The pulse output's response to faults is defined in the central FAILSAFE MODE function →  99.</li> </ul>

Functional description PULSE/STATUS OUTPUT	
<b>OUTPUT SIGNAL</b>	<p> <b>Note!</b> This function is not available unless the PULSE setting was selected in the OPERATING MODE function.</p> <p>Use this function to configure the output in such a way that it matches an external counter, for example. Depending on the application, you can select the direction of the pulses here.</p> <p><b>Options:</b> PASSIVE - POSITIVE PASSIVE - NEGATIVE</p> <p><b>Factory setting:</b> PASSIVE - NEGATIVE</p>
<b>ASSIGN STATUS OUTPUT</b>	<p> <b>Note!</b> This function is not available unless the STATUS setting was selected in the OPERATING MODE function.</p> <p>Configuration of the status output.</p> <p><b>Options:</b> ON (operation) ALARM NOTICE MESSAGE ALARM or NOTICE MESSAGE FLOW DIRECTION VOLUME FLOW LIMIT VALUE</p> <p><b>Factory setting:</b> ALARM</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ The behavior of the status output is a normally closed behavior, in other words the output is closed (transistor conductive) when normal, error-free measuring is in progress.</li> <li>■ It is very important to read and comply with the information on the switching characteristics of the status output → 83.</li> </ul>
<b>SWITCH-ON POINT</b>	<p> <b>Note!</b> This function is not available unless LIMIT VALUE or FLOW DIRECTION was selected in the ASSIGN STATUS OUTPUT function.</p> <p>Use this function to assign a value to the switch-on point (status output pulls up). The value can be equal to, greater than or less than the switch-off point. Positive and negative values are permissible.</p> <p><b>User input:</b> 5-digit floating-point number, [unit]</p> <p><b>Factory setting:</b> 0 [unit]</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ The appropriate unit is taken from the SYSTEM UNITS group.</li> <li>■ Only the switch-on point is available for flow direction output (no switch-off point). If you enter a value not equal to the zero flow (e.g. 5 ), the difference between the zero flow and the value entered corresponds to half the switchover hysteresis.</li> </ul>



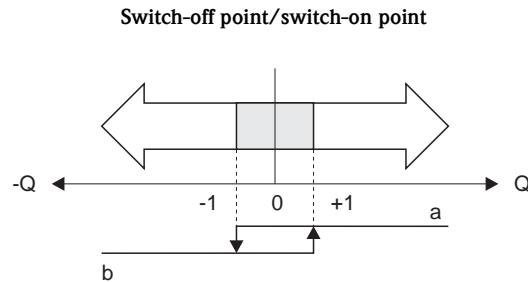
Functional description PULSE/STATUS OUTPUT	
<b>SWITCH-OFF POINT</b>	<p> <b>Note!</b> This function is not available unless LIMIT VALUE was selected in the ASSIGN STATUS OUTPUT function.</p> <p>Use this function to assign a value to the switch-off point (status output drops off). The value can be equal to, greater than or less than the switch-on point. Positive and negative values are permissible.</p> <p><b>User input:</b> 5-digit floating-point number, [unit]</p> <p><b>Factory setting:</b> 0 [unit]</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ The appropriate unit is taken from the SYSTEM UNITS group.</li> <li>■ If SYMMETRY is selected in the MEASURING MODE function and values with different signs are entered for the switch-on and switch-off points, the notice message "INPUT RANGE EXCEEDED" appears.</li> </ul>

### 11.9.1 Information on the response of the status output

#### General

If you have configured the status output for "LIMIT VALUE" or "FLOW DIRECTION", you can configure the requisite switch points in the SWITCH-ON POINT and SWITCH-OFF POINT functions. When the measured variable in question reaches these predefined values, the status output switches as shown in the illustrations below.

#### Status output configured for flow direction



a0001236

a = Status output conductive

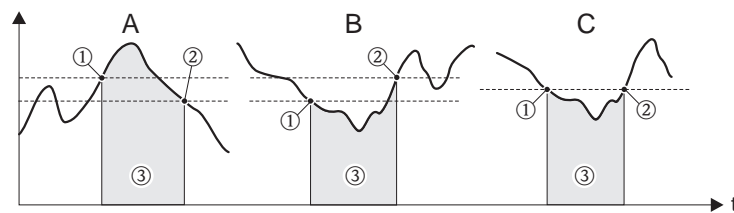
b = Status output not conductive

The value entered in the function ON-VALUE defines the switch point for the positive and negative directions of flow. If, for example, the switch point entered is  $1 \text{ m}^3/\text{h}$ , the status output switches off at  $-1 \text{ m}^3/\text{h}$  (not conductive) and switches on again at  $+1 \text{ m}^3/\text{h}$  (conductive). Set the switch point to 0 if your process calls for direct switchover (no switching hysteresis). If low flow cut off is used, it is advisable to set hysteresis to a value greater than or equal to the low flow.

#### Status output configured for limit value

The status output switches as soon as the measured variable undershoots or overshoots a defined switch point.

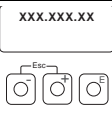









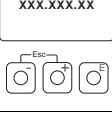

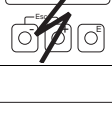

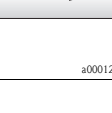
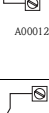




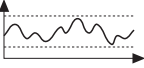

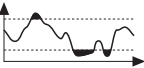

Application: Monitoring flow or process-related boundary conditions.





a0001235

- A = Maximum safety:  
→ ① SWITCH-OFF POINT > ② SWITCH-ON POINT
- B = Minimum safety:  
→ ① SWITCH-OFF POINT ② SWITCH-ON POINT
- C = Minimum safety:  
→ ① SWITCH-OFF POINT = ② SWITCH-ON POINT (this configuration should be avoided)
- ③ = Relay de-energized


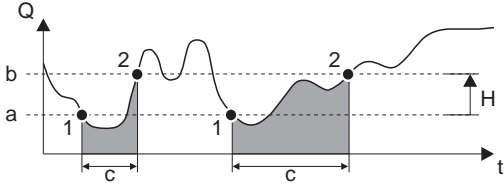
### 11.9.2 Switching behavior of the status output


Function	Status		Open collector behavior (Transistor)	
ON (operation)	System in measuring mode		conductive	 A0001237
	System not in measuring mode (power supply failed)		not conductive	 A0001239
Alarm	System OK		conductive	 A0001237
	Alarm → Error response of outputs/inputs and totalizer		not conductive	 A0001239
Notice message	System OK		conductive	 A0001237
	(System error or process error) Notice → Continuation of measuring		not conductive	 A0001239
Alarm or notice message	System OK		conductive	 A0001237
	Alarm → Failsafe mode or Notice → Continuation of measuring		not conductive	 A0001239
Flow direction	Forward	 a0001241	conductive	 A0001237
	Reverse	 a0001242	not conductive	 A0001239
Volume flow limit value	Limit value not overshoot or undershot	 a0001243	conductive	 A0001237
	Limit value overshoot or undershot (cannot be set at the same time)	 a0001244	not conductive	 A0001239

## 11.10 Group COMMUNICATION

Functional description COMMUNICATION	
 <b>Note!</b> The communication group is only visible if the HART option was selected in the CURRENT RANGE function.	
<b>TAG NAME</b>	<p>Use this function to enter a tag name for the measuring device. You can edit and read this tag name via the local display or the HART protocol.</p> <p><b>User input:</b>  Max. 8-character text, permitted characters are: A-Z, 0-9, +, -, underscore, space, period</p> <p><b>Factory setting:</b>  " _____ " (without text)</p>
<b>TAG DESCRIPTION</b>	<p>Use this function to enter a tag description for the measuring device. You can edit and read this tag description at the local display or via the HART protocol.</p> <p><b>User input:</b>  Max. 16-character text, permitted characters are: A-Z, 0-9, +, -, underscore, space, period</p> <p><b>Factory setting:</b>  " _____ " (without text)</p>
<b>FIELD BUS ADDRESS</b>	<p>Use this function to define the address for the exchange of data with the HART protocol.</p> <p><b>User input:</b>  0 to 15</p> <p><b>Factory setting:</b>  0</p> <p> <b>Note!</b>  Addresses 1 to 15: a constant 4 mA current is applied.</p>
<b>WRITE PROTECT</b>	<p>Use this function to activate HART write protection.</p> <p><b>Options:</b>  OFF = function can be edited/read via the HART protocol  ON = HART protocol write-protected (only readable)</p> <p><b>Factory setting:</b>  OFF</p>
<b>MANUFACTURER ID</b>	<p>Use this function to view the manufacturer number in decimal numerical format.</p> <p><b>Display:</b>  – Endress+Hauser  – 17 (<math>\cong</math> 11 hex) for Endress+Hauser</p>
<b>DEVICE ID</b>	<p>Use this function to view the device ID in hexadecimal numerical format.</p> <p><b>Display:</b>  62 hex (<math>\cong</math> 98 dez) for Prosonic Flow 91</p>

11.11 Group PROCESS PARAMETER

Functional description PROCESS PARAMETER	
ON-VALUE LOW FLOW CUT OFF	<p>Use this function to enter the switch-on point for low flow cut off. Low flow cut off is active if the value entered is not equal to 0. The sign of the flow value is highlighted on the display to indicate that low flow cut off is active.</p> <p><b>User input:</b> 5-digit floating-point number, [unit]</p> <p><b>Factory setting:</b> Depends on nominal diameter and country, [value] / [dm<sup>3</sup> to m<sup>3</sup> or US-gal] Corresponds to the factory setting for the low flow → 103.</p> <p> <b>Note!</b> The appropriate unit is taken from the SYSTEM UNITS group.</p> <p>The switch-off point is specified as a positive hysteresis from the switch-on point with 50%.</p>  <p><i>Q</i> Flow [volume/time] <i>t</i> Time <i>H</i> Hysteresis <i>a</i> SWITCH-ON POINT LOW FLOW CUT OFF = 200 dm<sup>3</sup>/h <i>b</i> Low flow switch-off point = 50% <i>c</i> Low flow cut off active <i>1</i> Low flow cut off is switched on at 200 dm<sup>3</sup>/h <i>2</i> Low flow cut off is switched off at 300 dm<sup>3</sup>/h</p> <p>a0001245</p>

Functional description PROCESS PARAMETER	
<b>ZERO POINT ADJUSTMENT</b>	<p>Use this function to start zero point adjustment automatically. The new zero point determined by the measuring system is adopted by the ZERO POINT function.</p> <p><b>Options:</b> CANCEL START</p> <p><b>Factory setting:</b> CANCEL</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>Zero point adjustment must only be carried out if the sensors have been replaced. The value determined should not be over 3 ns. If the value is overshoot, check whether the pipe actually has zero flow. For example, sunshine can partially warm the pipe and the resulting movement in liquid is measured as flow.</li> <li>Programming is locked during zero point adjustment. The message "ZEROPOINT ADJUST RUNNING" appears on the display.</li> <li>If the zero point adjustment is not possible, (e.g. if <math>v &gt; 0.1 \text{ m/s}</math>), or has been canceled, then the alarm message "ZERO ADJUST NOT POSSIBLE" is shown on the display.</li> </ul>
<b>ZERO POINT</b>	<p>Use this function to display the zero point correction value for the measuring pipe and the measuring sensors.</p> <p><b>Display:</b> Max. 5-digit number</p> <p><b>Factory setting:</b> 0 ns</p>

## 11.12 Group PIPE DATA

Functional description PIPE DATA	
<b>PIPE MATERIAL</b>	<p>Use this function to display the pipe material. This is specified by the option selected in the function PIPE STANDARD. If you edit the predetermined value, the pipe standard will be reset to the option OTHER and the function NOMINAL DIAMETER does not appear. The pipe material must be selected if the option OTHER was selected in the function PIPE STANDARD and thus a pipe standard is not defined.</p> <p><b>Options:</b>            CARBON STEEL            DUCTILE IRON            STAINLESS STEEL            ALLOY C            PVC            GRP            ASBESTOS CEMENT            PE            LDPE            HDPE            PVDF            PTFE            PA            PP            GLASS PYREX            OTHER</p> <p><b>Factory setting:</b>            STAINLESS STEEL</p>
<b>SOUND VELOCITY PIPE</b>	<p>Use this function to display the sound velocity in the pipe material. The sound velocity in the pipe must be specified.</p> <p><b>User input:</b>            Fixed-point number 800 to 6500 m/s</p> <p><b>Factory setting:</b>            3120 m/s</p>
<b>CIRCUMFERENCE</b>	<p>Use this function to display the pipe outer circumference. The pipe outer circumference or the pipe diameter must be specified.</p> <p><b>User input:</b>            Fixed point number 31.4 to 15,700.0 mm</p> <p><b>Factory setting:</b>            279.3 mm</p>
<b>PIPE DIAMETER</b>	<p>Use this function to display the pipe outer diameter. The pipe outer diameter or the pipe circumference must be specified.</p> <p><b>User input:</b>            Fixed-point number 10.0 to 5000.0 mm</p> <p><b>Factory setting:</b>            88.9 mm</p>


Functional description PIPE DATA	
WALL THICKNESS	<p>Use this function to display the wall thickness of the pipe. The wall thickness must be entered.</p> <p><b>User input:</b> Fixed point number 0.1 to max. 1000 mm (depends on nominal diameter)</p> <p><b>Factory setting:</b> 3.2 mm</p>


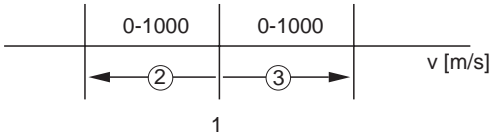




## 11.13 Group LINER

Functional description LINER	
<b>LINER MATERIAL</b>	<p>Use this function to display the liner material of the pipe. The liner material must be specified if a liner is present.</p> <p><b>Options:</b>            LINER NONE            MORTAR            RUBBER            TAR EPOXY            OTHER</p> <p><b>Factory setting:</b>            LINER NONE</p>
<b>SOUND VELOCITY LINER</b>	<p>Use this function to display the sound velocity of the liner. This is specified by the option selected in the function LINER MATERIAL. If you edit the predetermined value the liner material will be reset to the option OTHERS. The sound velocity of the liner must be entered if the option OTHER was selected in the function LINER MATERIAL.</p> <p><b>User input:</b>            Fixed-point number 800 to 6500 m/s</p> <p><b>Factory setting:</b>            Depends on the setting selected in the function LINER MATERIAL</p>
<b>LINER THICKNESS</b>	<p>Use this function to enter the thickness of the liner.</p> <p><b>User input:</b>            Fixed-point number 0.0 to 99.9 mm</p> <p><b>Factory setting:</b>            0 mm</p>



## 11.14 Group LIQUID DATA




Functional description LIQUID DATA	
<b>LIQUID</b>	<p>Use this function to select the liquid in the pipe.</p> <p><b>Options:</b>            WATER            SEA WATER            DISTILLED WATER            AMMONIA            ALCOHOL            BENZENE            BROMIDE            ETHANOL            GLYCOL            KEROSENE            MILK            METHANOL            TOLUOL            LUBE OIL            FUEL OIL            PETROL            OTHER</p> <p><b>Factory setting:</b>            WATER</p> <p> <b>Note!</b>            The selection specifies the values for the sound velocity and viscosity. If OTHER is selected, these must be entered via the SOUND VELOCITY LIQUID and VISCOSITY functions.</p>
<b>TEMPERATURE</b>	<p>Use this function to enter the process temperature of the liquid. Via the sound velocity, the value influences the determination of the sensor distance. Enter the process temperature at normal operating conditions to achieve an optimum configuration of the measuring system.</p> <p><b>User input:</b>            Fixed-point number -273.15 °C to 726.85 °C</p> <p><b>Factory setting:</b>            20 °C</p>

Functional description LIQUID DATA	
<b>SOUND VELOCITY LIQUID</b>	<p>Use this function to display the sound velocity of the liquid. This is determined via the values of the functions LIQUID and TEMPERATURE. If you edit the predetermined value, the function LIQUID will be reset to the option OTHER.</p> <p>The sound velocity of the liquid must be entered if the liquid is not available for selection in the function LIQUID and the option OTHER was selected here.</p> <p><b>Transmitter search range:</b> The measuring device searches for the measuring signal within a defined sound velocity range. The search range is specified in the functions SOUND VELOCITY NEGATIVE or SOUND VELOCITY POSITIVE. An error message is displayed if the sound velocity of the liquid is outside the search range.</p> <p> <b>Note!</b> We recommend you select a smaller search range in the event of unfavorable signal conditions (signal strength &lt; 50%).</p> <div style="text-align: center;">  </div> <p style="text-align: right; font-size: small;">a0001246</p> <p>1 = Sound velocity liquid          ② = Lower search range: defined in the function SOUND VELOCITY NEGATIVE          ③ = Upper search range: defined in the function SOUND VELOCITY POSITIVE</p> <p><b>User input:</b> Fixed-point number 400 to 3000 m/s</p> <p><b>Factory setting:</b> 1487.4 m/s</p>
<b>VISCOSITY</b>	<p>This function displays the viscosity of the liquid. This is determined via the values of the LIQUID and TEMPERATURE functions. If you edit the predetermined value the function LIQUID will be reset to the option OTHER. The viscosity must be entered if the liquid is not available for selection in the function LIQUID and the option OTHER was selected here.</p> <p><b>User input:</b> Fixed-point number 0.0 to 5000.0 mm<sup>2</sup>/s</p> <p><b>Factory setting:</b> 1 mm<sup>2</sup>/s</p>
<b>SOUND VELOCITY NEGATIVE</b>	<p>Use this function to specify the lower search range for the sound velocity of the liquid.</p> <p><b>User input:</b> Fixed-point number 0 to 1000 m/s</p> <p><b>Factory setting:</b> 500 m/s</p> <p> <b>Note!</b> Pay particular attention to the information in the function SOUND VELOCITY LIQUID.</p>

Functional description LIQUID DATA	
SOUND VELOCITY POSITIVE	<p>Use this function to specify the upper search range for the sound velocity of the liquid.</p> <p><b>User input:</b> Fixed-point number 0 to 1000 m/s</p> <p><b>Factory setting:</b> 500 m/s</p> <p> <b>Note!</b> Pay particular attention to the information in the function SOUND VELOCITY LIQUID.</p>

## 11.15 Group CONFIG. CHANNEL

Functional description CONFIG. CHANNEL	
<b>SENSOR TYPE</b>	<p><b>Options:</b>  W-CL-1F-L-B  W-CL-2F-L-B  W-CL-1F-L-C  W-CL-05F-L-B  W-CL-1F-M-B  W-CL-2F-M-B</p> <p><b>Factory setting:</b>  W-CL-2F-L-B</p>
<b>SENSOR CONFIGURATION</b>	<p>Use this function to select the configuration for the ultrasonic clamp-on sensors.</p> <p><b>Options:</b>  NO. TRAVERSE: 1  NO. TRAVERSE: 2  NO. TRAVERSE: 4</p> <p><b>Factory setting:</b>  NO. TRAVERSE: 2</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ 1 traverse for nominal diameters larger than DN 600, for certain plastic pipes with a wall thickness greater than 4 mm or if the signal strength is not sufficient in other arrangements.</li> <li>■ 2 traverses is the recommended configuration for pipes smaller than DN 600.</li> <li>■ 4 traverses can only be used for DN 50 in exceptional circumstances. The recommended configuration is 1 traverse.</li> </ul>
<b>CABLE LENGTH</b>	<p>Use this function to select the length of the sensor cable.</p> <p><b>Options:</b>  LENGTH 5 m/15 feet  LENGTH 10 m/30 feet  LENGTH 15 m/45 feet  LENGTH 30 m/90 feet  LENGTH 60 m/180 feet  LENGTH 100 m/300 feet</p> <p><b>Factory setting:</b>  LENGTH 5 m/15 feet</p> <p> <b>Note!</b></p> <p>The influence on the flow measurement caused by the cable length is minimal with nominal diameters under DN 80. For larger nominal diameters, the result is negligible.</p>

Functional description CONFIG. CHANNEL	
<b>POSITION SENSOR</b>	<p>Use this function to view the position of both sensors on the rail.</p> <p><b>Display:</b> 4-digit number combination</p> <p> <b>Note!</b> This function is only available if the number of traverses is 2 or 4 (see function SENSOR CONFIGURATION).</p>
<b>WIRE LENGTH</b>	<p>The wire length for assembling the sensors at the correct distance apart appears on the display.</p> <p><b>Display:</b> max. 4-digit number, including unit (e.g. 200 mm)</p> <p> <b>Note!</b> This function is only available if the number of traverses is 1 (see function SENSOR CONFIGURATION).</p>
<b>SENSOR DISTANCE</b>	<p>The distance between sensor 1 and sensor 2 appears on the display.</p> <p><b>Display:</b> max. 5-digit number, including unit (e.g. 200 mm)</p> <p> <b>Note!</b> 2 traverses cannot be used if the sensor distance is &lt;180 mm.</p>


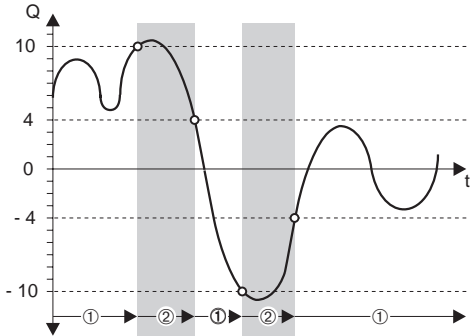
## 11.16 Group CALIBRATION DATA

Functional description CALIBRATION DATA	
<b>CAL. FACTOR</b>	<p>Use this function to call up the calibration factor currently used.</p> <p><b>Data indicated:</b> 5-digit floating-point number (typically 1.000)</p>
<b>ZERO POINT</b>	<p>Use this function to call up the zero point correction currently used.</p> <p><b>Data indicated:</b> 5-digit floating-point number with sign (e.g. +0200.0)</p>
<b>ZEROPOINT STAT.</b>	<p>Use this function to call up or manually change the static zero point correction currently being used.</p> <p><b>User input:</b> 5-digit floating-point number, including unit and sign (e.g. +0010.0 ns)</p>
<b>CORR. FACTOR</b>	<p>Use this function to enter a correction factor at the client's site.</p> <p><b>User input:</b> 5-digit floating-point number between 0.5 and 2.</p> <p><b>Factory setting:</b> 1.000 (no correction)</p>


## 11.17 Group SYSTEM PARAMETER

Functional description SYSTEM PARAMETER	
<b>INSTALLATION DIRECTION SENSOR</b>	<p>Use this function to reverse the sign of the flow quantity, if necessary.</p> <p><b>Options:</b> FORWARDS (flow as indicated by the arrow) BACKWARDS (flow opposite to direction indicated by the arrow)</p> <p><b>Factory setting:</b> NORMAL</p>
<b>MEASURING MODE</b>	<p>Use this function to select the measuring mode for all outputs and for the internal totalizer.</p> <p><b>Options:</b> STANDARD SYMMETRY</p> <p><b>Factory setting:</b> STANDARD</p> <p>The responses of the individual outputs and the internal totalizer in each of the measuring modes are described in detail on the following pages:</p> <p><b>Current output</b> STANDARD Only the flow components for the selected flow direction are output, (positive or negative full scale value ② = flow direction). Flow components in the opposite direction are not taken into account (suppression).</p> <p>Example for current output:</p> <p style="text-align: right;">a0001248</p> <p><b>SYMMETRY</b> The output signals of the current output are independent of the direction of flow (absolute amount of the measured variable). The "VALUE 20mA" ③ (e.g. backflow) corresponds to the mirrored VALUE 20 mA ② (e.g. flow). Positive and negative flow components are taken into account.</p> <p>Example for current output:</p> <p style="text-align: right;">a0001249</p> <p> <b>Note!</b> The direction of flow can be output via the configurable status output.</p> <p>(continued on next page)</p>








Functional description SYSTEM PARAMETER	
MEASURING MODE (Contd)	<p><b>Pulse output</b></p> <p>STANDARD Only flow components of the positive flow direction are output. Components in the opposite direction are not taken into account.</p> <p>SYMMETRY The absolute value of the positive and negative flow components is taken into account.</p> <p><b>Status output</b></p> <p> Note! The information is only applicable if LIMIT VALUE was selected in the function ASSIGN STATUS OUTPUT.</p> <p>STANDARD The status output signal switches at the defined switch points.</p> <p>SYMMETRY The status output signal switches at the defined switch points, irrespective of the sign. In other words, if you define a switch point with a positive sign, the status output signal switches as soon as the value is reached in the negative direction (negative sign), (see illustration).</p> <p>Example for the SYMMETRY measuring mode: Switch-on point: Q = 4 Switch-off point: Q = 10 ① = Status output switched on (conductive) ② = Status output switched off (nonconductive)</p>  <p><b>Totalizer</b></p> <p>STANDARD Only positive flow components are output. Negative components are not taken into account.</p> <p>SYMMETRY The positive and negative flow components are balanced. In other words, net flow in the flow direction is registered.</p>

A0001247





Functional description SYSTEM PARAMETER	
<b>POSITIVE ZERO RETURN</b>	<p>Use this function to interrupt evaluation of measured variables. This is necessary when a piping system is being cleaned, for example. This setting acts on all function and outputs of the measuring device.</p> <p><b>Options:</b>  OFF  ON → Signal output is set to the "ZERO FLOW" value.</p> <p><b>Factory setting:</b>  OFF</p>
<b>FLOW DAMPING</b>	<p>Use this function to set the filter depth of the digital filter. The sensitivity of the measurement signal can be reduced with respect to interference peaks (e.g. in the event of a high solid content, gas bubbles in the fluid etc.). The reaction time of the measuring system increases with the filter setting.</p> <p><b>User input:</b>  0 to 60 s</p> <p><b>Factory setting:</b>  2 s</p> <p> <b>Note!</b></p> <ul style="list-style-type: none"> <li>■ The system damping acts on all functions and outputs of the measuring device.</li> <li>■ The higher the value set, the stronger the damping (higher response time).</li> </ul>

## 11.18 Group SUPERVISION

Functional description SUPERVISION	
<b>FAILSAFE MODE</b>	<p>The dictates of safety render it advisable to ensure that the device signal processing assumes a predefined state in the event of an alarm. The setting you select here is valid for:</p> <ul style="list-style-type: none"> <li>■ Current output</li> <li>■ Pulse output</li> <li>■ Totalizer</li> </ul> <p> <b>Note!</b> This has no effect on the display.</p> <p><b>Options:</b> MINIMUM VALUE MAXIMUM VALUE CURRENT VALUE (not recommended)</p> <p><b>Factory setting:</b> MINIMUM VALUE The response of the individual outputs and the totalizer is listed below.</p> <p><b>Current output:</b> MINIMUM VALUE The current output adopts the value of the lower signal on alarm level (as defined in the CURRENT SPAN function on →  77).</p> <p>MAXIMUM VALUE The current output adopts the value of the upper signal on alarm level (as defined in the CURRENT SPAN function on →  77).</p> <p>ACTUAL VALUE Measuring value output based on the actual flow measurement (alarm is ignored).</p> <p><b>Pulse output:</b> MINIMUM or MAXIMUM VALUE Output is zero pulse</p> <p>ACTUAL VALUE Measuring value output based on the actual flow measurement (alarm is ignored).</p> <p><b>Totalizer:</b> MINIMUM or MAXIMUM VALUE The totalizer is paused while an alarm is present.</p> <p>ACTUAL VALUE The totalizer continues to count on the basis of the current flow value. The fault is ignored.</p>
<b>ACTUAL SYSTEM CONDITION</b>	<p>Use this function to check the current system condition.</p> <p><b>Display:</b> "SYSTEM OK" or the diagnosis message with the highest priority.</p>
<b>PREVIOUS SYSTEM CONDITIONS</b>	<p>Use this function to view the 20 most recent diagnosis messages since measuring last started.</p> <p><b>Display:</b> The last 20 diagnosis messages.</p>

Functional description SUPERVISION	
<b>ALARM DELAY</b>	<p>Use this function to define a time span in which the criteria for an error have to be satisfied without interruption before an error or notice message is generated. Depending on the setting and the type of error, this suppression acts on the:</p> <ul style="list-style-type: none"> <li>■ Display</li> <li>■ Current output</li> <li>■ Pulse/status output</li> </ul> <p><b>User input:</b> 0 to 100 s (in steps of one second)</p> <p><b>Factory setting:</b> 0 s</p> <p> <b>Caution!</b> If this function is activated error and notice messages are delayed by the time corresponding to the setting before being forwarded to the higher-order controller (process controller, etc.). It is therefore imperative to check in advance in order to make sure whether a delay of this nature could affect the safety requirements of the process. If error and notice messages cannot be suppressed, a value of 0 seconds must be entered here.</p>
<b>SYSTEM RESET</b>	<p>Use this function to perform a reset of the measuring system.</p> <p><b>Options:</b> NO RESTART SYSTEM (restart without interrupting power supply) MEASURING PIPE DATA (restore the original calibration data)</p> <p> <b>Note!</b> The T-DAT has to be present for the original calibration data to be restored successfully when the MEASURING PIPE DATA option is selected. If this is not the case, the error message DATA STORAGE appears.</p> <p><b>Factory setting:</b> MEASURING PIPE DATA</p>

## 11.19 Group SIMULATION SYSTEM

Functional description SIMULATION SYSTEM	
<b>SIMULATION FAILSAFE MODE</b>	<p>Use this function to set all outputs and the totalizer to their defined failsafe modes, in order to check whether they respond correctly. During this time, the words "SIMULATION FAILSAFE MODE" appear on the display.</p> <p><b>Options:</b> ON OFF</p> <p><b>Factory setting:</b> OFF</p>
<b>SIMULATION MEASURAND</b>	<p>Use this function to set all outputs and the totalizer to their defined flow-response modes, in order to check whether they respond correctly. During this time, the words "SIMULATION MEASURAND" appear on the display.</p> <p><b>Options:</b> OFF VOLUME FLOW</p> <p><b>Factory setting:</b> OFF</p> <p> <b>Note!</b>  <ul style="list-style-type: none"> <li>■ The measuring device cannot be used for measuring while this simulation is in progress.</li> <li>■ The setting is not saved if the power supply fails.</li> </ul> </p>
<b>VALUE SIMULATION MEASURAND</b>	<p> <b>Note!</b> This function is not available unless the SIMULATION MEASURAND function is active (= VOLUME FLOW).</p> <p>Use this function to define a freely selectable value (e.g. 12 m<sup>3</sup>/s). This is used to test downstream devices and the measuring device itself.</p> <p><b>User input:</b> 5-digit floating-point number [unit], with sign</p> <p><b>Factory setting:</b> 0 [unit]</p> <p> <b>Caution!</b> The setting is not saved if the power supply fails.</p> <p> <b>Note!</b> The appropriate unit is taken from the SYSTEM UNITS group.</p>

## 11.20 Group SENSOR VERSION

Functional description SENSOR VERSION	
<b>SERIAL NUMBER</b>	Use this function to view the serial number of the measuring system.

## 11.21 Group AMPLIFIER VERSION

Functional description AMPLIFIER VERSION	
<b>SOFTWARE REVISION NUMBER</b>	Use this function to view the software revision number of the electronics board.

## 11.22 Factory settings

### 11.22.1 SI units

Parameter	Factory setting
Nominal diameter	80 [mm]
Low flow ( $v \approx 0.04$ m/s)	12 [l/min]
Full scale value ( $v \approx 2.5$ m/s)	750 [l/min]
Pulse value	5.0 [l]
Unit totalizer	[l]
Unit length	mm
Unit temperature	° C

### 11.22.2 US units (for USA and Canada only)

Parameter	Factory setting
Nominal diameter	3"
Low flow ( $v \approx 0.04$ m/s)	2.5 [gal/min]
Full scale value ( $v \approx 2.5$ m/s)	200 [gal/min]
Pulse value	2.0 [gal]
Unit totalizer	gal
Unit length	mm
Unit temperature	° C

### 11.22.3 Language

Country	Language
Australia	English
Belgium	English
Canada	English
China	English
Denmark	English
Germany	Deutsch
England	English
Finland	English
France	Francais
Holland	English
Hong Kong	English
India	English
Indonesia	English
International Instruments	English
Italy	Italiano
Japan	English
Malaysia	English
Norway	English
Poland	English
Portugal	English
Austria	Deutsch
Russia	English
Sweden	English
Switzerland	Deutsch
Singapore	English
Spain	Espanol
South Africa	English
Thailand	English

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# Declaration of Contamination

## Erklärung zur Kontamination

Because of legal regulations and for the safety of our employees and operating equipment, we need the "declaration of contamination", with your signature, before your order can be handled. Please make absolutely sure to include it with the shipping documents, or - even better - attach it to the outside of the packaging.

*Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination", bevor Ihr Auftrag bearbeitet werden kann. Legen Sie diese unbedingt den Versandpapieren bei oder bringen Sie sie idealerweise außen an der Verpackung an.*

### Type of instrument / sensor

Geräte-/Sensortyp \_\_\_\_\_

### Serial number

Seriennummer \_\_\_\_\_

### Process data/ Prozessdaten

Temperature / Temperatur \_\_\_\_\_ [°C] Pressure / Druck \_\_\_\_\_ [ Pa ]

Conductivity / Leitfähigkeit \_\_\_\_\_ [ S ] Viscosity / Viskosität \_\_\_\_\_ [mm<sup>2</sup>/s]

### Medium and warnings

Warnhinweise zum Medium



	Medium /concentration Medium /Konzentration	Identification CAS No.	flammable entzündlich	toxic giftig	corrosive ätzend	harmful/ irritant gesundheitsschädlich/ reizend	other * sonstiges*	harmless unbedenklich
Process medium Medium im Prozess								
Medium for process cleaning Medium zur Prozessreinigung								
Returned part cleaned with Medium zur Endreinigung								

\* explosive; oxidising; dangerous for the environment; biological risk; radioactive

\* explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv

Please tick should one of the above be applicable, include security sheet and, if necessary, special handling instructions.

*Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.*

### Reason for return / Grund zur Rücksendung

\_\_\_\_\_  
\_\_\_\_\_

### Company data / Angaben zum Absender

Company / Firma _____	Contact person / Ansprechpartner _____
_____	Department / Abteilung _____
Address / Adresse _____	Phone number/ Telefon _____
_____	Fax / E-Mail _____
_____	Your order No. / Ihre Auftragsnr. _____

We hereby certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free from any residues in dangerous quantities.

*Hiermit bestätigen wir, dass die zurückgesandten Teile sorgfältig gereinigt wurden, und nach unserem Wissen frei von Rückständen in gefährbringender Menge sind.*

\_\_\_\_\_  
(place, date / Ort, Datum)

\_\_\_\_\_  
(Company stamp and legally binding signature)  
(Firmenstempel und rechtsverbindliche Unterschrift)

[www.endress.com/worldwide](http://www.endress.com/worldwide)

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**Endress+Hauser**   
People for Process Automation

---

# The Dingo System



The Dingo is a smart solar controller that can expand as your needs grow.

The Dingo 20/20 is the next generation solar charge controller from Plasmatronics. We have taken the best features of the PL series controllers, drawn on our extensive industry experience and created a controller that's in a class of its own.



- **Takes the heat**  
Full charge and full load current in 50°C heat. All day, every day.
- **Local Service**  
Fast, reliable, affordable, Plasmatronics service. Long after the warranty ends.
- **Hidden Wiring**  
All the wires are covered.

- Reliable, easy to understand, one button interface and proven, easy to learn menu structure.
- Symmetrical charge and load currents, both 20A.
- Industry standard four stage charging regime.
- 12,24,32,36 and 48V selectable. Only one controller to stock.

- **Negative Ground.** Easier to use in vehicles and easier to understand for people used to working with vehicle electric systems.
- **More terminals.** A terminal for every wire. Wiring is simpler and quicker.
- **More Data** 512 days storage



Roomy termination area with wire tie posts

- **New Communications Bus.**  
Rugged new bus uses the MODBUS protocol (industry standard)
- **Enhanced one button interface**  
Now with *Reverse gear* for adjustment downwards and *Fast Forward*.
- **LED backlighting** for the display



Enhanced Display

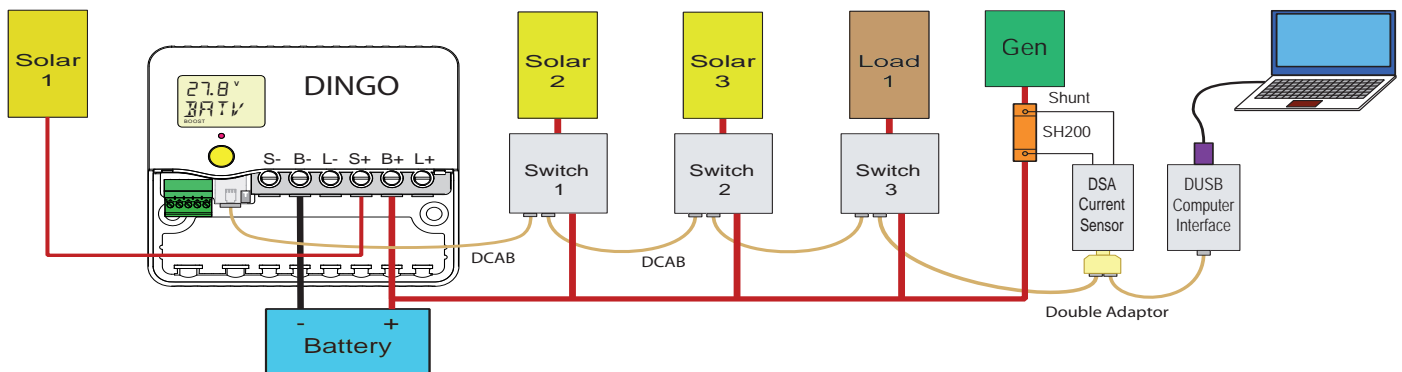


Dingo System v1.0 October 09



Radio Repeater Mt. Elder: Australian Antarctic Division

# Meet the Members of the Team



## Dingo 2020 Controller 12-48V 20A Charge 20A Load



The Dingo series of solar controllers is exceptionally versatile. They give the user unparalleled capability to adjust the function of the controller and to monitor the performance of the energy system. For detailed information, download the Dingo reference manual from our website. ([www.plasmatronics.com.au](http://www.plasmatronics.com.au))

Size: 157x124x52mm (in box)  
Weight: 482g (in box)  
RRP: \$335.50 inc. GST.

## Measuring other currents - the DSA External Shunt Adaptor

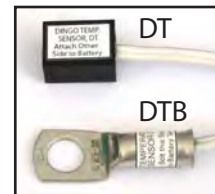


The DSA reads external charge or load currents. Range 0-255A (0.1A steps, bidirectional). It's isolated - insert anywhere. Max. 4 per system. Supports 75mV/200A, 50mV/100A & 100mV/100A shunts. (Includes a DCAB cable)

RRP \$161.70 inc. 180g Box 146x129x57mm

**SH200 Shunt 75mV/200A**

RRP \$55 inc. 290g 160x45x32mm



**Battery Temperature Sensors.**

DT 52g RRP \$29 inc  
DTB 60g RRP \$29 inc  
(with 3m cable)

**DCAB 3m bus cables** RRP \$17.60 inc

**Double Adaptor** RRP \$6 inc.

## Communications - the DUSB & D232



The DUSB provides a USB interface to a computer. This allows the user to download data from the controller and change settings if required.

The D232 provides an RS232 interface (DTE) designed for remote computer access via a modem.

(Both are electrically isolated and do not require a separate power supply)

**DUSB** RRP \$93 inc. Box 146x129x57mm 240g (includes DCAB cable & PRISM monitor software)

**D232** RRP \$93 inc. Box 146x129x57mm 192g (includes DCAB cable & PRISM monitor software)

## New team members in development: Switchblock, Remote control

Available from your distributor or direct from Plasmatronics Pty Ltd. ph 03 9486 9902  
fax 03 9480 3022. For more information go to [www.plasmatronics.com.au](http://www.plasmatronics.com.au)





Job No	0017022	Contract / PO Number	N02922UI
Job Name	Tantivy St Sewage Flowmeter	Client Document Number	<<ClientDocNo>>
ITP Description	SAT and commissioning		
Component	Installation	Item / Tag Number / Panel No	
Drawing Reference	8395-E-01.m		

Section 1 EQUIPMENT RECORDING (Place a ✓ / N/A in the blocks)				
Equipment Item	Recorded Information	CHECKED BY		
		Operator	L/Hand	Tester
Record main switching device rating	6 Amps			
Record contactor KW rating	- KW			
Record Power Cable rating	mm <sup>2</sup> Control Wiring 0.75+1.5mm <sup>2</sup>			

Section 2 PANEL ASSEMBLY CHECKLIST (Place a ✓ / N/A in the blocks)				
GENERAL	CHECKED BY			
	Operator	L/Hand	Tester	
Check Panel is clean and free of loose objects	TB			
All Drilled Holes Deburred including Label screw holes	NA			
Rubber blanking gromets are fitted to all unused holes	NA			
Check Panel for correct IP Rating	NA			
Correct Gland plate material and size used	NA			
Labels are fitted and correct	NA			
Door Locks correct and hinges tight	NA			
Shrouding fitted where applicable	NA			
Paint colour correct and acceptable	NA			
All wiring supports are suitable on doors and panels	TB			
All doors requiring earth have earth studs fitted and are terminated correctly	TB			
Door escutcheon and cutouts are correct	NA			
Overall dimensions are correct	NA			

Section 3 PANEL ASSEMBLY CHECKLIST (Place a ✓ / N/A in the blocks)				
WIRING & CABLING	CHECKED BY			
	Operator	L/Hand	Tester	
All Power Cable is Correct Current Rating	TB			
All Power Cable is free of sharp Bends (Minimum Bend Radius is 6 x Dia of cable)	TB			
All Power Cable is Coloured or Marked with a band of heat shrink	NA			
All Power and Control Looms are neat	TB			
All Terminations are Tight	TB			
All control Wiring is correct colour and size	TB			
All Terminal Bridge Links are fitted to terminal strips	NA			
All Wire Numbers are Fitted and correct	TB			
All terminals are numbered	TB			
Door Looms are secured at door and compartment	TB			
All Equipment is correctly earthed	TB			
All wiring access holes are bushed	NA			

Section 4 FUNCTIONAL TESTING (Place a pass/N/A in the blocks)				
EQUIPMENT ITEMS	CHECKED BY			
	Operator	L/Hand	Tester	
Main Switching Device Operation			TB	
Contactor Operation			NA	
Live Line Indicator Phasing			NA	
Push Button & Selector Switch Operation			NA	
Metering Operation			NA	
Auxiliary Devices Operation			NA	

OPERATOR (signing off for sections 1,2 & 3)	Date Comp	Print Name	Sign Name
LEADING HAND (signing off for sections 1,2 & 3)	Date Comp	Print Name	Sign Name

## TEST EQUIPMENT

- Multimeter

- CIPS Equip. No.

## Testing Officer Comments &amp; Notes:

PRE-EXISTING INSTALLATION - FLOOD EFFECTED BOARD → Replaced like for like components + wiring + cleaned Switchboard.  
ALL SWITCHBOARD WIRING WAS P→PT TESTED.  
CHECKED / ADJUSTED DC → DC CONVERTER Voltage POWERED UP BY 24VDC Supply & checked for correct voltages -

Tested By: (Conneq Authorised Officer)		Witnessed By: (Client if applicable)	
(Name)	Tim Bouna	(Name)	
(Sign)	[Signature]	(Sign)	
Date	31/4/12	Date	1/1

NOTE: Ensure relevant items or comments are recorded on the Hit List (SF-1100)

**Testing Officer Comments & Notes:**

Tested By: (Conneq Authorised Person) Witnessed By: (Client if applicable)

(Name) Sharon Howling (Name) \_\_\_\_\_

(Sign) [Signature] (Sign) \_\_\_\_\_

Date 2/7/12 Date 1/1/12

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# Tantivy Flow Meter

## Control System SAT

### Client

Queensland Urban Utilities

### Document No

017022-TS-03-B-CONTROL SYSTEM SAT.DOCX

### REVISION B

Site ID and Name	<b>Tantivy Flow Meter</b>
Test Date	3.../.../2012
Lend Lease Operative	PAUL MATTHEWS

#### CORPORATE OFFICE

185 Queensport Rd North, Murarrie, Qld, 4172

PO Box 792, Wynnum, QLD, 4178

Tel: +61 7 3908 3908

Fax: +61 7 3908 3883

[www.lendlease.com](http://www.lendlease.com)

Lend Lease Infrastructure Services Pty Ltd



## Control Sheet

<b>Prepared By:</b>	<b>Barrie Heaton</b>	<b>Date:</b>	<b>12/06/2012</b>
<b>Checked By:</b>	<b>Paul Matthews</b>	<b>Date:</b>	<b>12/06/2012</b>
<b>Authorised For Issue By:</b>	<b>Richard Behan-Howell</b>	<b>Date:</b>	<b>12/06/2012</b>

## Distribution List

<b>Copy</b>	<b>Recipient or Location</b>
1	Praveen Gaddam (QUU)
2	Richard Behan-Howell (Lend Lease)
3	Barrie Heaton (Lend Lease)
4	Paul Matthews (Lend Lease)
5	
6	
7	

## Revision List

<b>Rev</b>	<b>Date</b>	<b>Comment</b>	<b>Approved</b>
A	12/06/2012	Issued for Review	
B	12/06/2012	Modify distribution list	

QUU

SCADA USER INTERFACE SPECIFICATION

Lend Lease Job: 00017022

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**Tantivy Flow Meter****SITE OPERATION SAT - Lend Lease Engineering Infrastructure Services**

## Abbreviations and Definitions

Abbreviation	Definition
ACMA	Australian Communications and Media Authority
ADSL	Asymmetric Digital Subscriber Line
CAL	Client Access Licence
CAT	Commissioning Acceptance Testing
CMI	Control Microsystems
CMF	Central Monitoring Facility
CPU	Central Processing Unit
CSV	Comma Separated Variable File
DMR	Digital Microwave Radio
DMZ	Demilitarized Zone
DOL	Direct On-Line
EP Rating	Environmental Priority Rating
ES	Engineering Station
FAT	Factory Acceptance Testing
GST	Goods and Service Tax
GUI	Graphical User Interface
HLZ	High Level Zone
HMI	Human Machine Interface
I&C	Instrumentation & Controls
IO	Inputs and Outputs
LL	Lend Lease Infrastructure Services

QUU	Lend Lease Job: 00017022	Page 3 of 11
SITE OPERATION SAT		

**Tantivy Flow Meter****SITE OPERATION SAT - Lend Lease Engineering Infrastructure Services**

IS	Information Systems
ISaGRAF	ICS Triplex ISaGRAF is an IEC-61131-3 compliant software development application
ITP	Inspection and Test Plan
KFII	King Fisher Series II Protocol
km	Kilometre
KVM	Keyboard Video Mouse (Switch)
LAN	Local Area Network
LCD	Liquid Crystal Display
MTU	Master Telemetry Unit
OS	Operating System
PAT	Performance Acceptance Testing
PCS	Process Control System
PDD	Project Definition Document
PDF	Portable Document Format
PLC	Programmable Logic Controller
QA	Quality Assured
RF	Radio Frequency
RSSI	Received Signal Strength Indication
RTU	Remote Telemetry Unit
SAT	Site Acceptance Testing
SCADA	Supervisory Control and Data Acquisition
SOW	Scope of Works
SWR	Standing Wave Ratio
TIA	Totally Integrated Automation
UHF	Ultra High Frequency

QUU

SITE OPERATION SAT

Lend Lease Job: 00017022

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Tantivy Flow Meter

SITE OPERATION SAT - Lend Lease Engineering Infrastructure Services

W	Watt
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QUU SITE OPERATION SAT	Lend Lease Job: 00017022	Page 5 of 11
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**Tantivy Flow Meter****SITE OPERATION SAT - Lend Lease Engineering Infrastructure Services****Document Control**

Prepared For:	Queensland Urban Utilities
Project Name:	Tantivy Flow Meter
Lend Lease Job Code:	17022
Document Type:	CONTROL SYSTEM SAT
File Name:	017022-TS-03-B-Control System SAT.docx
Revision:	B
Status:	Issued
Release Date:	12 May 2012
Prepared By:	Barrie Heaton
	Senior Control Systems Engineer
Reviewed By:	Paul Matthews
	Senior Control System Engineer
Lend Lease Approval By:	Richard Behan-Howell
	Engineering Section Lead

QUU

SITE OPERATION SAT

Lend Lease Job: 00017022

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Tantivy Flow Meter

SITE OPERATION SAT - Lend Lease Engineering Infrastructure Services

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SITE OPERATION SAT		

**Tantivy Flow Meter****SITE OPERATION SAT - Lend Lease Engineering Infrastructure Services****1 INITIAL TRIO RADIO COMMUNICATION SETUP****1.1 TRIO RADIO COMMUNICATION TO CLEARSCADA**

Task	Completed
Record installed radio serial number	72689
When powered confirm radio in sync using LED indication.	OK <input checked="" type="checkbox"/>
Perform Radio Commissioning report to be provided with this SAT document. Record RSSI	OK <input checked="" type="checkbox"/> Rx Sig dBm = -78 dBm
Confirm on ClearSCADA that the site is connected through DNP3 communication.	OK <input checked="" type="checkbox"/>
Record bearing that antenna has been set up to.	120°

**1.2 CLEARSCADA SITE INSTANCE**

Task	Completed
Install new ClearSCADA instance in ClearSCADA.	OK <input checked="" type="checkbox"/>
Install embedded mimic of flow meter on network map.	OK <input checked="" type="checkbox"/>
Set DNP3 address + other available parameters.	2070 OK <input checked="" type="checkbox"/>
Test comms healthy to RTU once power available.	OK <input checked="" type="checkbox"/>

QUU

SITE OPERATION SAT

Lend Lease Job: 00017022

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**Tantivy Flow Meter****SITE OPERATION SAT - Lend Lease Engineering Infrastructure Services****2 RTU INITIAL SETUP****2.1 RTU PARAMETERS**

Task	Completed
Set DNP Address	<u>2070</u>
Check/Set the RTU Clock from SCADA.	OK <input checked="" type="checkbox"/>

**2.2 BATTERY**

Task	Completed
Check that the battery is connected and charging (i.e.24VDC across the terminals)	OK <input checked="" type="checkbox"/>
Check that the RTU and radio system runs off the battery when the mains supply is isolated.	OK <input checked="" type="checkbox"/>

**2.3 INTRUDER ALARM**

Task	Completed
Close all doors to panel, verify Intruder alarm is not present (60 second delay after closing all doors).	OK <input checked="" type="checkbox"/>
Open door to panel, verify Intruder alarm is present.	OK <input checked="" type="checkbox"/>

QUU

SITE OPERATION SAT

Lend Lease Job: 00017022

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**Tantivy Flow Meter****SITE OPERATION SAT - Lend Lease Engineering Infrastructure Services****3 SCADA COMMISSIONING CHECKS****3.1 INITIATING ALARMS TO PROVE COMMUNICATIONS TO CLEARSCADA**

Task	Observation	Completed
Cycle solar power alarm check	Ensure that solar Power OK alarm on ClearSCADA Station Status has received a Critical level alarm	OK <input checked="" type="checkbox"/>
RTU power supply alarm check	Remove AC power to RTU 24VDC Power Supply.	N/A OK <input type="checkbox"/>
Confirm Flow Reading	Confirm the flow displayed at site matches that displayed in the ClearSCADA	OK <input checked="" type="checkbox"/>
Test poll button from ClearSCADA. Record approx. poll time	Verify that the time taken to poll/update site on ClearSCADA is acceptable (< 5-10 seconds)	OK <input checked="" type="checkbox"/> 2 Seconds

**3.2 POST SITE CLEARSCADA COMMISSIONING**

Task	Observation	Completed
Flow readings	Flow readings trending	OK <input checked="" type="checkbox"/>
Confirm correct navigation to site thorough both menu system and via catchment map	Navigation correct	OK <input checked="" type="checkbox"/>
Check alarm and event history for the site on ClearSCADA to see if and anomalies have occurred.	Comments:  NONE TO REPORT	OK <input checked="" type="checkbox"/>

QUU

SITE OPERATION SAT

Lend Lease Job: 00017022

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## Tantivy Flow Meter

## SITE OPERATION SAT - Lend Lease Engineering Infrastructure Services

## 4 SIGN OFF/NOTES

## 4.1 RECORD OF SETUP/WITNESS

Lend Lease Operative	Signature	Date
PAUL MATTHEWS	P. Matthews	3/7/2012

QUU	Signature	Date

## 4.2 NOTES

FLOW METER DETAILS (ALSO SAVED IN PACTWARE FILE)  
 PIPE DATA - DIAMETER 711mm, STAINLESS STEEL, 6mm THICK  
 LINER - 22 mm, SOUND VELOCITY 3400 m/s

0-750 V/s = 4-20 mA

1 kL = 1 Pulse

SIGNAL STRENGTH = 26.6 dB

SENSOR DISTANCE = 742.67 mm

QUU	Lend Lease Job: 00017022	Page 11 of 11
SITE OPERATION SAT		



# Tantivy Flow Meter

## Control System FAT

### Client

Queensland Urban Utilities

### Document No

017022-TS-01-B-CONTROL SYSTEM FAT.DOCX

REVISION B

Site ID and Name	SFM351 TANTIVY ST FLOW METER
Test Date	12 /6/2012
Lend Lease Operative	PAUL MATTHEWS

CORPORATE OFFICE

185 Queensport Rd North, Murarrie, Qld, 4172

PO Box 792, Wynnum, QLD, 4178

Tel: +61 7 3908 3908

Fax: +61 7 3908 3883

[www.lendlease.com](http://www.lendlease.com)

Lend Lease Infrastructure Services Pty Ltd



## Control Sheet

<b>Prepared By:</b>	<b>Barrie Heaton</b>	<b>Date:</b>	<b>12/06/2012</b>
<b>Checked By:</b>	<b>Paul Matthews</b>	<b>Date:</b>	<b>12/06/2012</b>
<b>Authorised For Issue By:</b>	<b>Richard Behan-Howell</b>	<b>Date:</b>	<b>12/06/2012</b>

## Distribution List

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## Revision List

<b>Rev</b>	<b>Date</b>	<b>Comment</b>	<b>Approved</b>
A	12/06/2012	Issued for review	
B	12/06/2012	Modifications to items tested and distribution list	
C			
D			
E			

QUU CONTROL SYSTEM FAT	Lend Lease Job: 00017022	Page 2 of 10
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**Tantivy Flow Meter - CONTROL SYSTEM FAT****Abbreviations and Definitions**

<b>Abbreviation</b>	<b>Definition</b>
ACMA	Australian Communications and Media Authority
ADSL	Asymmetric Digital Subscriber Line
CAL	Client Access Licence
CAT	Commissioning Acceptance Testing
CMI	Control Microsystems
CMF	Central Monitoring Facility
CPU	Central Processing Unit
CSV	Comma Separated Variable File
DMR	Digital Microwave Radio
DMZ	Demilitarized Zone
DOL	Direct On-Line
EP Rating	Environmental Priority Rating
ES	Engineering Station
FAT	Factory Acceptance Testing
GST	Goods and Service Tax
GUI	Graphical User Interface
HLZ	High Level Zone
HMI	Human Machine Interface
I&C	Instrumentation & Controls
IO	Inputs and Outputs
LL	Lend Lease Infrastructure Services
IS	Information Systems
ISaGRAF	ICS Triplex ISaGRAF is an IEC-61131-3 compliant software development application
ITP	Inspection and Test Plan

**Tantivy Flow Meter - CONTROL SYSTEM FAT**

KFII	King Fisher Series II Protocol
km	Kilometre
KVM	Keyboard Video Mouse (Switch)
LAN	Local Area Network
LCD	Liquid Crystal Display
MTU	Master Telemetry Unit
OS	Operating System
PAT	Performance Acceptance Testing
PCS	Process Control System
PDD	Project Definition Document
PDF	Portable Document Format
PLC	Programmable Logic Controller
QA	Quality Assured
RF	Radio Frequency
RSSI	Received Signal Strength Indication
RTU	Remote Telemetry Unit
SAT	Site Acceptance Testing
SCADA	Supervisory Control and Data Acquisition
SOW	Scope of Works
SWR	Standing Wave Ratio
TIA	Totally Integrated Automation
UHF	Ultra High Frequency
W	Watt



**Tantivy Flow Meter - CONTROL SYSTEM FAT****Document Control**

<b>Prepared For:</b>	Queensland Urban Utilities
<b>Project Name:</b>	Tantivy Flow Meter
<b>Lend Lease Job Code:</b>	17022
<b>Document Type:</b>	CONTROL SYSTEM FAT
<b>File Name:</b>	017022-TS-01-B-Control System FAT.docx
<b>Revision:</b>	B
<b>Status:</b>	Issued
<b>Release Date:</b>	12 June2012
<b>Prepared By:</b>	Barrie Heaton
	Senior Control Systems Engineer
<b>Reviewed By:</b>	Paul Matthews
	Senior Control System Engineer
<b>Lend Lease Approval By:</b>	Richard Behan-Howell
	Engineering Section Lead

QUU CONTROL SYSTEM FAT

Lend Lease Job: 00017022

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**Tantivy Flow Meter - CONTROL SYSTEM FAT**

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<b>4.1.</b>	<b>Record of setup/witness .....</b>	<b>10</b>
<b>4.2.</b>	<b>Notes .....</b>	<b>10</b>

**Tantivy Flow Meter - CONTROL SYSTEM FAT****1. INITIAL TRIO RADIO COMMUNICATION SETUP****1.1. TRIO RADIO COMMUNICATION TO CLEARSCADA**

Task	Completed
Program Radio as per required repeater settings.	N/A OK <input type="checkbox"/>
Record installed radio serial number	-----
Save configuration to QUU SVN (Tantivy.cfg)	OK <input type="checkbox"/>

**Tantivy Flow Meter - CONTROL SYSTEM FAT****2. KINGFISHER RTU****2.1. POWER UP BOARD**

Task	Complete
Check that the RTU powers up OK	OK <input checked="" type="checkbox"/>
Check all boards mounted in backplane	OK <input checked="" type="checkbox"/>

**2.2. BATTERY**

Task	Completed
Connect DC supply to RTU (simulating supply from Solar battery system)	OK <input checked="" type="checkbox"/>
Check that the battery is connected and charging (i.e.24VDC across the terminals)	OK <input checked="" type="checkbox"/>
Disconnect DC supply – SCADA Alarms, RTU runs from battery	OK <input checked="" type="checkbox"/>
Reconnect DC supply. Check alarm clears.	OK <input checked="" type="checkbox"/>
Disconnect Battery. Check battery fail and not charging alarms active	N/A OK <input type="checkbox"/>

**2.3. INTRUDER ALARM**

Task	Completed
Close all doors to panel, verify Intruder alarm is not present (simulate).	OK <input checked="" type="checkbox"/>
Open door to panel, verify Intruder alarm is present and latches for 60 seconds when door closed.	OK <input checked="" type="checkbox"/>

**2.4. MODULE STATUS**

Task	Completed
Confirm SCADA correctly reflects healthy module state (All 3 modules). Alarms when IO3 removed.	OK <input checked="" type="checkbox"/>

**2.5. SYSTEM TEMPERATURE**

Task	Completed
Confirm SCADA and RTU correspond. Check value trended in degrees C.	OK <input checked="" type="checkbox"/>

**2.6. RTU - DETAILS**

Task	Completed
------	-----------

**Tantivy Flow Meter - CONTROL SYSTEM FAT****3. FLOW****3.1. CHECK SITE – SCADA VALUES CORRESPOND**

Task	Observation	Completed
Flow	Check site RTU instantaneous L/s flow reading matches value displayed on SCADA	OK <input checked="" type="checkbox"/>
Invalid	Disconnect flow meter analogue loop – Invalid alarm should be generated on SCADA (<2mA)	OK <input checked="" type="checkbox"/>
High	Inject a flow signal that is above the high flow SP – confirm SCADA alarm	OK <input checked="" type="checkbox"/>
Flow rate range feedback	Confirm range value set in RTU and SCADA correspond	OK <input checked="" type="checkbox"/>
Flow Today	Simulate kL pulses and confirm range value set in RTU and SCADA correspond	OK <input checked="" type="checkbox"/>
Flow Yesterday	Confirm range value set in RTU and SCADA correspond	OK <input checked="" type="checkbox"/>
Total	Confirm range value set in RTU and SCADA correspond	OK <input checked="" type="checkbox"/>

**3.2. MIDNIGHT TOTALISING**

Flow Today	At midnight, this value passed to Flow Yesterday	OK <input checked="" type="checkbox"/>
Flow Yesterday	At midnight, flow today value passed here	OK <input checked="" type="checkbox"/>

**3.3. FLOW TOTAL RESET**

Task	Completed
Observe flow totals readings – all set to zero when reset button pressed	OK <input checked="" type="checkbox"/>

**3.4. TRENDS**

Task	Completed
Verify items trended as shown on IO list FAT test document.	OK <input checked="" type="checkbox"/>

**3.5. SITE POLL**

Task	Completed
Test site poll generates current data and logs correct poll time	OK <input checked="" type="checkbox"/>









Job No0017022

Job NameQUU Tantivy SPS Flow Meter

ComponentClearSCADA to Kingfisher CP30 DNP FAT



ITEM No:	LOCATION / DESCRIPTION	EXPECTED OUTCOME	FAT		
			PASS	DATE	LL Testing Officer SIGN.
1	1 - Binary Inputs	IO connected and tested as decsribed	✓	12/6	PM P. Wms
2	10 - Binary Outputs	IO connected and tested as decsribed	✓	"	" P. Wms
3	30 - Analogue Inputs	IO connected and tested as decsribed	✓	"	" P. Wms
4	40 - Analogue Outputs	IO connected and tested as decsribed	✓	"	" P. Wms
5	110 - Strings	IO connected and tested as decsribed	✓	"	" P. Wms

Testing Officer Comments & Notes:

Items Outstanding:

Note: 1 Test Sheets available if required

2 Contact Control Room (3810 7339) to inquire about what status to leave the SPS in before leaving the site. i.e. In Auto or in Manual operation

Tested By: (LL Testing Officer)

Witnessed By: (Client)

NamePAUL MATTHEWS

Sign.P. Wms

Date12/6/2012

Name

Sign.

Date

					Other Kingfisher data	ClearSCADA Tag Configuration											SCADA Pre-FAT Test					FAT Test
Point	CP30 Kingfisher Toolbox+ IsaGRAF Dictionary Ref	Event Class	Static Var	Event Var	Point Type Din/Derived	ClearSCADA Tag Name	Item	Template Location	Subgroup on tab book	ClearSCADA tooltip text	Alarm Severity	Trend Point (Y/N)	State 0	State 1	Further Description/FAT Action	DNP3 Point/Tab book connected	Alarm & Severity + Trend	Graphical Item Description	Graphical Item	Option hidden on tab book/graphic when deselected	Operation proven during FAT	
0	DNPBI0	1	0	0	Din (from PS11/12)	Rtu : 1 : Over temperature	RTU	Status	Tab Book : Battery	The RTU is running over nominal operating temperature (greater than 70 degrees Centigrade)	C	Y	None: Off	Alarm: Active	RTU Over temperature	✓	✓	Tab book and alarm halo	✓	✓	✓	
1	DNPBI1	2	0	0	Din (from PS11/12)	Rtu : 1 : Battery : Fail (Kingfisher)	RTU	Status	Tab Book : Battery	RTU DC power supply indicates battery has failed	H	Y	None: Off	Alarm: Active	RTU Battery Failed - RTU Power Supply D/O	✓	✓	Tab book and alarm halo	✓	✓	✓	
2	DNPBI2	1	0	0	Din (from PS11/12)	Rtu : 1 : Mains fail (Power Supply)	RTU	Status	Tab Book : Supply	RTU DC power supply indicates supply has failed	C	Y	None: Off	Alarm: Active	RTU 240V Power Supply Failed. NB This alarm is disabled when	✓	✓	Tab book and alarm halo	✓	✓	✓	
3	DNPBI3	1	0	0	Spare	Spare	Spare	Spare		Spare	C	Y										
4	DNPBI4	1	0	0	Spare	Spare	Spare	Status	Spare	Spare	C	Y										
5	DNPBI5	2	0	0	Derived (from PS11/12)	Rtu : 1 : DC over voltage	RTU	Status	Tab Book : Supply	The DC power supply for the Kingfisher is above normal operating Voltage	H	Y	None: Off	Alarm: Active	The DC power supply for the Kingfisher is above normal	✓	✓	Tab book and alarm halo	✓	✓	✓	
6	DNPBI6	2	0	0	Derived (from PS11/12)	Rtu : 1 : DC under voltage	RTU	Status	Tab Book : Supply	The DC power supply for the Kingfisher is below normal operating Voltage	H	Y	None: Off	Alarm: Active	The DC power supply for the Kingfisher is below normal	✓	✓	Tab book and alarm halo	✓	✓	✓	
7	DNPBI7	2	0	0	Derived	Flow meter : 1 : High	Spare	Status	Tab Book : Flow Meter	Flow meter high L/s reading	H	Y	None: Off	Alarm: Active	Flow meter reading is above high user entered setpoint	✓	✓	Tab book and alarm halo	✓	✓	✓	
8	DNPBI8	2	0	0	Din (from PS11/12)	Rtu : 1 : Battery : Not charging	RTU	Status	Tab Book : Battery	Battery Charging State	H	Y	Alarm: Not Charging	None: Charging	Battery power supply for the Kingfisher is below normal	✓	✓	Tab book and alarm halo	✓	✓	✓	
9	DNPBI9	1	0	0	Din (from Module 1)	Rtu : 1 : Module 1 OK	RTU	Status	Tab Book : Battery	RTU Hardware Module 1 is OK/Failed	C	Y	Alarm: Failed	None: OK	RTU Module 1 OK	✓	✓	Tab book and alarm halo	✓	✓	✓	
10	DNPBI10	1	0	0	Din (from Module 2)	Rtu : 1 : Module 2 OK	RTU	Status	Tab Book : Battery	RTU Hardware Module 2 is OK/Failed	C	Y	Alarm: Failed	None: OK	RTU Module 2 OK	✓	✓	Tab book and alarm halo	✓	✓	✓	
11	DNPBI11	1	0	0	Din (from Module 3)	Rtu : 1 : Module 3 OK	RTU	Status	Tab Book : Battery	RTU Hardware Module 3 is OK/Failed	C	Y	Alarm: Failed	None: OK	RTU Module 3 OK	✓	✓	Tab book and alarm halo	✓	✓	✓	
12	DNPBI12	1	0	0	Din	Security : 1 : Intruder	Station	Status	Tab Book : Security	One or more door switches are indicating door opened	C	Y	None: Off	Alarm: Active	Station Security Alarm (Door switch)	✓	✓	Tab book and alarm halo	✓	✓	✓	
13	DNPBI13	2	0	0	Derived	Flow meter : 1 : Invalid	Flow	Status	Tab Book : Flow Meter	Flow Meter raw level is invalid (<2mA or >20mA)	H	Y	None: Off	Alarm: Active	Flow Meter raw level is below 4mA dead band, or is above 20mA+dead band	✓	✓	Tab book and alarm halo	✓	✓	✓	

\*Note Item in Red text changed from Multiswatt to Kingfisher  
IO from Multiswatt device that will not be required in this project  
New IO changed from that of Multiswatt DNP3 IO

ClearSCADA Tag Configuration												SCADA Pre-FAT Test					FAT
Point	CP30 Kingfisher Toolbox+ IsaGRAF Dictionary Ref	Event Class	Deadband	ClearSCADA Tag name	Item	Template Location	Subgroup on tab book	Units	ClearSCADA tooltip text	Trend Point (Y/N)	Further Description/FAT Action	DNP3 Point/Tab book connected (changed in RTU and read in SCADA)	Alarm & Severity + Trend	Graphical FAT Description (Values displayed in specified Template and Subgroup location)	Graphical Item	Option hidden on tab book/graphic when disabled	Read value from Kingfisher to SCADA
0	DNPA0	2	25	Flow meter : 1 : Flow	Flow	Status	Tab Book : Flow Meter	L/s	Flow In Engineering Units (L/s)	Y	Flow Meter In Engineering Units (Capped Flow rate, L/s)	✓	✓	Display in Tab book	✓	✓	✓
1	DNPA1	2	1000	Flow meter : 1 : Total flow	Flow	Statistics	Tab Book : Flow Meter	L	Flow Volume total (since last reset)	Y	Flow total since last reset in RTU.	✓	✓	Display in Tab book	✓	✓	✓
2	DNPA2	2	1000	Flow meter : 1 : Total flow today	Flow	Statistics	Tab Book : Flow Meter	L	Flow Volume today	Y	Flow today. Reset at midnight	✓	✓	Display in Tab book	✓	✓	✓
3	DNPA3	2	1000	Flow Meter : 1 : Total flow yesterday	Flow	Statistics	Tab Book : Flow Meter	L	Flow Volume yesterday	Y	Flow yesterday.	✓	✓	Display in Tab book	✓	✓	✓
4	DNPA4	2	5C	Rtu : 1 : System temperature	RTU	Status	Tab Book : RTU	C	Temperature recorded inside the Kingfisher (Celsius)	Y	Temperature being monitored in the Kingfisher (Celsius)	✓	✓	Display in Tab book	✓	✓	✓
5	DNPA5	2	0	Flow meter : 1 : Flow rate Range Fbk	Flow	Status	Tab Book : Flow Meter	L/s	Flow Meter - Engineering Range Setpoint (L/s)		Flow Meter Engineering Range (L/s)	✓	✓	Display in Tab book	✓	✓	✓
6	DNPA6	2	1	RTU : 1 : Supply Voltage	RTU	Status	Tab Book : Supply	V	Kingfisher Power Supply Voltage		Kingfisher Power Supply Voltage	✓	✓	Display in Tab book	✓	✓	✓

SCADA Analogue Outputs (80)

\*Note Item in Red text changed from Multisport to Kingfisher  
X2 from Multisport device that will not be required in this project.  
New ID (changed from that of Multisport DNP3 IO)

ClearSCADA Tag Configuration										SCADA Pre-FAT Test						FAT	
Point	CP30 Kingfisher Toolbox+ IsaGRAF Dictionary Ref	Event Class	Event Var	ClearSCADA Tag name	Item	Template Location	Subgroup on tab book	Units	ClearSCADA tooltip text	Trend Point (Y/N)	Further Descriptions*FAT Action	DNP3 Point in tab book connected (changed from RTU and read in SCADA)	Alarm & Severity + Trend	Graphical FAT Descripti on (Values displayed in specified Template and Sugroup location) Display in Tab book	Graphical Item	Option hidden on tab book/graphic when deselected	Read value from Kingfisher to SCADA
0	DNPAC0	1	0	Flow meter : 1 Flow	Flow	Control	Tab Book - Flow Meter Alarm Subports	L/s	High L/s flow setpoint	Y	✓	✓	✓	✓	✓	✓	✓