Zertifiziertes QM-System
DIN EN ISO 9001
Zertifikat-Nr. 01017

Differential Flow Computer

with temperature compensation

measuring • monitoring • analysing

ZFC

- Displays compensated consumption (flow rate), total and accumulated total
- Supply and return line: display temperature and compensated flow rate
- Large 17 mm digit selection for flow rate or total
- 7 digit resettable total, 11 digit accumulated total
- Auto backup of settings and running totals
- Full Modbus communication RS485
- 8 - 24 $V_{AC/DC}$ power supply
- Sensor supply 3 / 8.2 / 12 / 24 V_{DC}
- LED backlight

Z2

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Description

The flow computer model ZFC has been developed to calculate corrected differential liquid volume at normal conditions for generic products. A typical application is the measurement of fuel consumption by engines for power generators, e.g. on board ships and locomotives. The usual difficulties encountered in such applications include: pulsating flows, very low consumption readings, vibration and high ambient temperatures. These are all well catered for in the design and operation of the ZFC. The corrected volumetric flow in each line is calculated using the thermal expansion coefficient algorithm stored in the flow computer. The reference temperature can be defined as desired, e.g. 15 °C, 20 °C or 60 °F. The ZFC is your first and safest choice for field mount indicators, especially in harsh weather conditions like rain, snow, salty atmospheres and temperatures between -40 °C up to +80 °C (-40 °F up to 176 °F).

Display

The display has large 17 mm (0.67") and 8 mm (0.31") digits which can be set to show flow rate, total and temperature. On-screen engineering units are easily configured from a comprehensive menu. The accumulated total registers up to 11 digits and is backed-up in EEPROM memory every minute.

Configuration

All configuration settings are accessed via a simple operator menu which can be password protected. Each setting is clearly indicated with an alphanumerical description, which avoids confusing abbreviations and baffling codes. All settings are safely stored in EEPROM memory in the event of sudden power failure.

Analogue output signal

The calculated consumption (flow rate) is re-transmitted with the 4 - 20 mA or output signal. The output signal is updated eight times per second with a filter function being available to smoothen out the signal if desired. The output value is user defined in relation to the flow rate, e.g. 4 mA equals to 15 l/h and 20 mA equals to 2000 l/h. The output signal is passive, active or isolated where the passive output type will loop power the ZFC as well.

Pulse, negative / decreasing total output

One scalable pulse output reflects the count on the accumulated display. The second output is configurable as pulse, negative or decreasing total output. The pulse length is user defined and the maximum output frequency is 500 Hz. The output signal is a passive NPN.

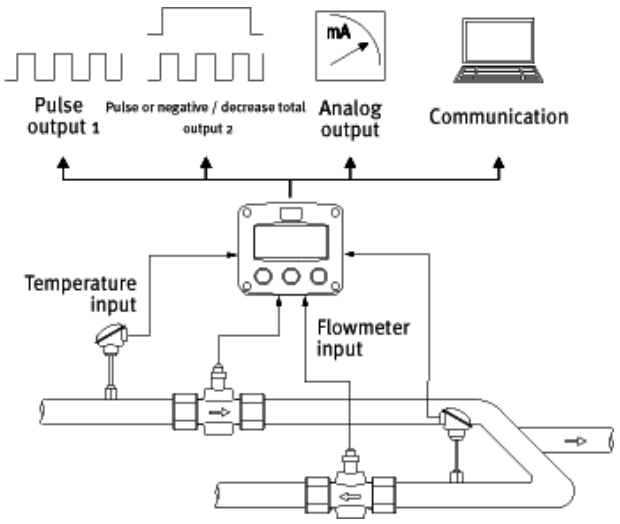
Signal inputs

The flow computer measures the uncorrected volumetric flow and temperature in both supply and return line. The ZFC will accept most pulse input signals for flow. For the temperature measurement, 2 or 3 wire PT100 elements can be used.

Communication

All process data and settings can be read and modified manually or through the Modbus communication link (R S485)

Overview application ZFC



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Technical Details

Display

Type:	high intensity reflective numeric and alphanumeric LCD, UV-resistant
Dimensions:	90 x 40 mm (3.5" x 1.6")
Digits:	seven 17 mm (0.67") and eleven 8 mm (0.31") digits. Various symbols and measuring units
Refresh rate:	user definable: fast, 1 s, 3 s, 15 s, 30 s, off
Backlight:	transflective LCD with white LED-backlight. Good readings in full ambient temperature

Ambient temperature

-40 °C ... +80 °C (-40 °F ... +176 °F)

Power requirements

	8 - 24 $V_{AC/DC}$ ± 10 %, power consumption max. 5 W
Backlight:	12 - 30 V_{DC} ± 10%, power consumption max. 1.5 W

Sensor excitation

Type:	1.2 / 3 / 8.2 / 12 / 24 V_{DC} - max. 50 mA @ 24 V_{DC}. U_{max} sensor is 2 V below U_{supply}

Terminal connections

Type:	removable plug-in terminal strip. wire max. 1.5 mm² and 2.5 mm²

Data protection

Type:	EEPROM backup of all settings. Backup of running totals every minute. Data retention at least 10 years
Password:	configuration settings can be password protected

Directives & Standards

EMC:	Directive 2014/30/EU, FCC 47 CFR part 15
Low voltage:	Directive 2014/35/EU
RoHS:	Directive 2011/65/EU
IP & NEMA:	EN 60529 & NEMA 250

Enclosure

General

Window:	polycarbonate window
Sealing:	silicone
Control keys:	three industrial micro-switch keys. UV-resistant silicone keypad

GRP wall / field mount enclosures

General:	GRP wall/field mount enclosure IP67 / NEMA type4X, UV-resistant and flame retardant
Dimensions:	130 x 120 x 75 mm (5.12" x 4.72" x 2.95") - W x H x D
Weight:	600 gr
Cable entry:	6 x Ø 12 mm
Cable glands:	polyamide blind plugs: 6 x M12 incl. locknuts and O-rings (mounted)

Signal inputs

Flowmeter

	coil / sine wave (HI: 20 mVpp or LO: 80 mVpp -sensitivity selectable), NPN/PNP, open collector, reedswitch, Namur, active pulse signals 8, 12 and 24 V_{DC}
Frequency:	minimum 0 Hz - maximum 7 kHz for total and flow rate. Maximum frequency depends on signal type and internal low-pass filter. E.g. reed switch with low-pass filter: max. frequency 120 Hz
K-Factor:	0.000010 - 9999999 with variable decimal position
Low-pass filter:	available for all pulse signals

Temperature

Update time:	one time per two seconds
Type:	2 or 3 wire PT100
Range:	-100 °C ... +200 °C (-148 °F ... 392 °F)
Accuracy:	0.1 °C (0.18 °F)

Signal outputs

Communication

Functions:	Reading display information, reading / writing all configuration settings
Protocol:	Modbus RTU
Speed:	1200 - 2400 - 4800 - 9600 baud
Addressing:	maximum 255 addresses
Type:	RS485 2-wire

Digital outputs

Function:	one pulse output according to differential or sumaccumulated total and one configurable pulse, negative or decreasing total output
Frequency:	max. 500 Hz, pulse length user definable between 0.001 s ... 9.999 s
Type:	two passive transistor outputs (NPN) - not isolated, max. 50 V_{DC} - 300 mA per output

Analogue output

Function:	transmitting compensated differential flow rate
Accuracy:	10 bit, error <0.05 %, analog output signal can be scaled to any desired range
Update time:	eight times per second
Type:	passive galvanically isolated 4 - 20 mA output

Operational

Operator functions

Displayed function:

- Compensated differential flow rate (consumption)
- Compensated differential total and acc. total
- Supply line - Inlet temperature and comp. flow rate
- Return line - Outlet temp. and comp. flow rate
- Total can be reset to zero by pressing the CLEAR-key twice

Total

Digits:	7 digits
Units:	l, m^3, GAL, USGAL, kg, lb, bbl, no unit
Decimals:	0 - 1 - 2 or 3
Note:	total can be reset to zero

Accumulated total

Digits:	11 digits
Units / decimals:	according to selection for total
Note:	can not be reset to zero

Flow rate

Digits:	7 digits
Units:	ml, l, m3, Gallons, kg, Ton, lb, bl, cf, REV, ft3, scf, Nm^3, Nl, igal - no units
Decimals:	0 - 1 - 2 or 3
Time units:	/sec - /min - /hr - /day

Line temperature

Digits:	6 digits
Units:	°C, °F or K
Decimals:	1

Flow equations

Type:	corrected liquid volume
Formula:	$Q_{normal} = Q \times (1 + \alpha (T_{normal} - T))$ where α= thermal expansion coefficient
Normal temperature:	default: 273.15 K - any temperature can be set

Order Details (Example: **ZFC- K FT 4T 0 3 0 0**)

Model	Enclosure	Input	Output	Communication	Power supply	ATEX	Special version
ZFC-...	**K** = wall mounting enclosure, glass fibre reinforced, plastic, IP67	**FT** = pulse: coil, NPN, PNP, Namur, reed, 1x PT100 2/3 wires	**4T** = 4 - 20 mA, galv, separated, 2x passive transistor	**0** = without **M** = RS 485 Modbus RTU, 2 wires	**3** = 8 - 24 $V_{AC/DC}$ incl. sensor supply	**0** = without	**0** = without **Y** = special (specify in clear text)

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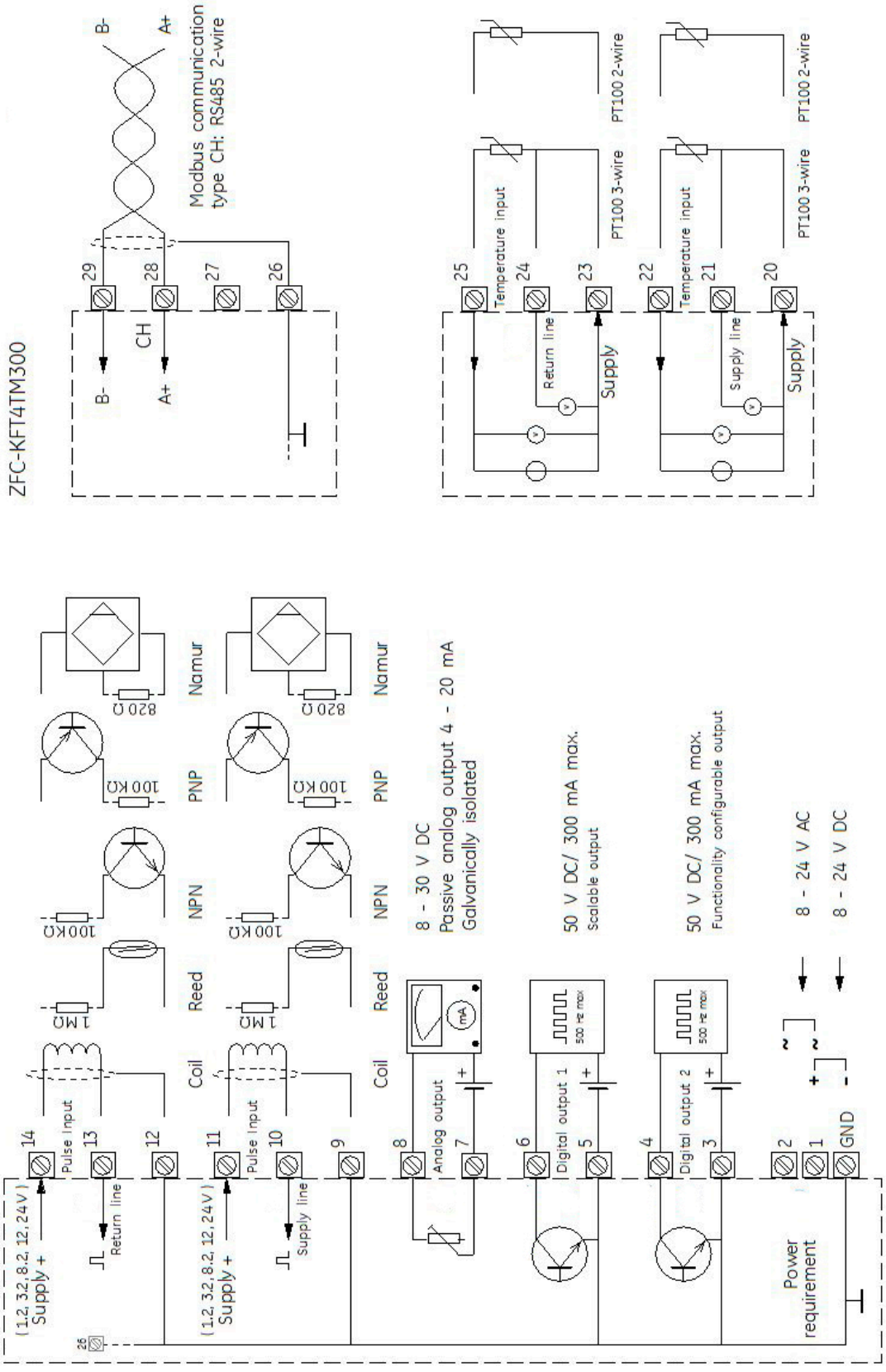
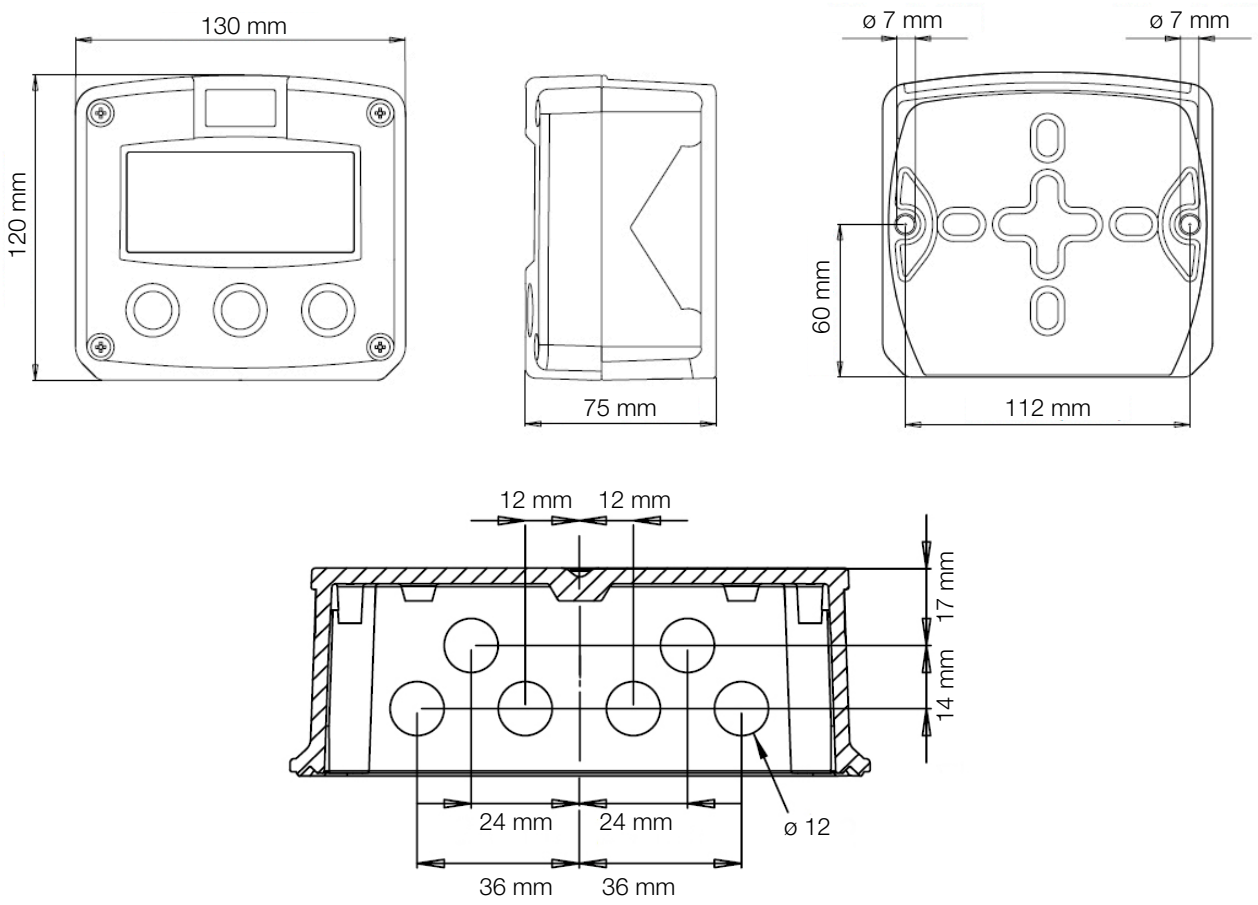
Typical Wiring Diagram for ZFC-KFT4TM300



Dimensions ZFC



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