



Operating Instructions

**ET-65-B, ET-75-B, ET-125-B
ET-125-BM**

Device platform Falcon

R. STAHL HMI Systems GmbH
Adolf-Grimme-Allee 8
D 50829 Köln

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Publisher and copyright holder:

R. STAHL HMI Systems GmbH
Adolf-Grimme-Allee 8
D 50829 Köln

Company located at: Cologne
Court of registration: District court Cologne, HRB 30512
VAT number: DE 812 454 820

Telephone: (switchboard) +49 (0) 221 76 806 - 1000
(hotline) - 5000
Fax: - 4100
E-mail: (switchboard) office@stahl-hmi.de
(otline) support@stahl-hmi.de

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1 Preface

These Operating Instructions contain all aspects relevant to explosion protection for the ET-65-B, ET-75-B, ET-125-B and ET-125-BM operator interfaces (device platform Falcon). They also contain information on the connection and installation of these devices.

-  These Operating Instructions are only valid for ET-Falcon devices built after the fifth supplement (see type code) !
-  All data relevant to explosion protection from the EC-type examination certificate were copied into these operating instructions.
-  For the correct operation of all associated components please note, in addition to these operating instructions, all other operating instructions enclosed in this delivery as well as the operating instructions of the additional equipment to be connected.
-  Please also note that all certificates of the ET-Falcon devices can be found in a separate document (CE_ET-Falcon-B) !




2 Device function

The operator interfaces device platform Falcon are intelligent operating and monitoring devices with text or graphic display for use in hazardous environments of zones 1, 2, 21 and 22 according to ATEX guideline.

Falcon operator interfaces can be used for simple automation tasks or access control in tankfarms. The device platform Falcon can be connected to all major automation systems. The great variety of function keys and soft keys of the various product versions provide for a great many individual settings. Typical communication tasks include data transfer via Profibus DP, Modbus, MPI or other serial protocols.

For installation in zones 1, 2, 21 and 22 the Falcon HMIs require an external power supply and various media converters for the connection to the Fieldbus system.

3 Technical Data

			
Function / Equipment	ET-65-B	ET-75-B	ET-125-B ET-125-BM
Display type	LCD monochrome graphic display		
Display size	134 mm x 40,4 mm	114 mm x 64 mm	
Resolution	240 x 64 pixels	240 x 128 pixels	
Backlight (with additional 9143)	LED backlight		
Backlight adjustable	Contrast adjustment using key combination		
Service life of backlight at +25°C	approx. 50,000 h		
Display	Transparent membrane		Glass panel
Keyboard	Polyester membrane on FR4 material; > 1 million actions		
Functional keys	16	8	16
custom labelling	yes	no	yes
Soft keys	4	no	8
Cursor keys	yes	yes	yes
Alphanumeric and system keys	23	23	23
System LED´s	4 (STOP, COM, ONLINE, ALARM)		5 (STOP, COM, ONLINE, ALARM, INFO)
Key LED´s, controllable	16	-	12
Free controllable LED´s	-	4 (2 yellow, 2 green)	
Power supply	10.8 VDC, 8...12.5 VDC via 9143/10 power supply		
Connections	via plug-in screw terminals, 2.5 mm ² green		
Current consumption [mA]	max. 180		
Total binary inputs / electrical parameters	8 floating contacts, switches/ pushbuttons / 3.3 V, 2 mA each		
Real time clock / Data buffer	Yes (capacitor buffered, maintenance-free) / > 4 days		
Interfaces			
Communication	RS-422 (bus-compatible) connection to 9185/11		
Reader unit interface (optional via additional module)	Connection for reader devices (Barcode scanner, Proximity reader interface)		
additional interfaces (optional via additional module)			
Serial RS-232 / RS-422 or RS-485	with 9185/11-45-xx		
Profibus DP	with 9185/11-46-xx		
MPI	with 9185/11-45-xx and MPI-Box SSW7-RK512-RS-232		
Ethernet TCP/ IP	TCP / IP or UDP with 9185/11-45-xx and SK-Cobox		
Processor	Winbond W771C32P		
Configuration memory type	Flash EEPROM		
Program memory size [kByte]	8x64 (512) Flash RAM		
Main memory, buffered [kByte]	128 (> 4 days)		
Record memory [kByte]	12 / ca. 200...500 messages		
Conf. memory size [kByte]	448		
Number of protocol drivers	3 (loadable via PC software)		
Operating system	SPSPlusWIN		
Language support	4 system languages (German, English, French, Dutch)		
Number of process images	100 / 20 bitmaps per language		
Number of texts / messages	Max. 5900		
Number of fault messages	512 (bit controlled)		

Function / Equipment	ET-65-B			ET-75-B			ET-125-B ET-125-BM	
Font sets	3 (freely definable) IBM code table, 437 predefined in 3 sizes							
Predefined Fonts (for all devices)	6x8	6x12	12x21	18x32	CYR6x8	CYR6x12	CYR12x21	CYR18x32
Number of lines								
ET-65-B	8	5	3	2	8	5	3	2
ET-75-B / ET-125-B / ET-125-BM	16	10	6	4	16	10	6	4
Number of characters/ line	40	40	20	13	40	40	20	13
Character height [ca. mm]	6	6	10	15	6	6	10	15
Housing								
ET-65-B / ET-75-B / ET-125-B	Front: aluminium with polyester membrane, seal, IP 65 Back: plastic with fastening-/arrester plate, IP 20							
ET-125-BM	Front: aluminium with polyester membrane, seal, IP 65 Back stainless steel, IP 20							
Ambient temperature, operation	-20°C...+70°C (+60°C at T4)							
Storage temperature	-30°C...+80°C							
Relative humidity	90% at 40 °C, without condensation							
Vibration	Operation: 3 to 22 Hz: 1 mm 22 to 500 Hz: 9.8m/s ² = 1 g Transport: 3 to 9 Hz: 3.5 mm 9 to 500 Hz: 9.8 m/s ² = 1 g							
Shock loading	Operation: 150 m/s ² = about 15 g / 11 ms Transport: 250 m/s ² = about 25 g / 6 ms							
Dimensions W x H [mm]	290 x 146						312 X 192	
H at ET-125-BM							202	
Cut-out W x H [mm] (+/- 0.5)	275 x 131						300 x 180	
Mounting depth [approx. mm]	80							
Wall thickness [mm]	<10							
Installation space [approx. mm]	392 x 282 x 96							
Weight [gr.]	approx. 1290			approx. 1270			approx. 1225	
at ET-125-BM	-			-				

4 Conformity to standards

The operator interfaces comply with the following standards and directives:

Standard		Classification
ATEX directive		
5 th Supplement		
until 19.04.2016	from 20.04.2016	
94/9/EC	2014/34/EU	
EN 60079-0 : 2012		General requirements
EN 60079-11 : 2012		Intrinsic safety "i"
Electromagnetic compatibility		
EMC directive		
until 19.04.2016	from 20.04.2016	Classification
2004/108/EC	2014/30/EU	
EN 61000-6-2 : 2006		Immunity
EN 61000-6-4 : 2007 + A1 : 2011		Emission
RoHS directive		
2011/65/EU		Classification
EN 50581 : 2012		Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

5 Certifications

The Falcon operator interfaces have been approved for the following scopes:

Europe:

by ATEX directive
for installation in zones 1, 2, 21 und 22

International / Australia:

IECEX (International Electrotechnical Commission System for Certification to Standards for Electrical Equipment for Explosive Atmospheres)

India:

PESO (Ministry of Commerce & Industry, Petroleum and Explosives Safety Organisation)

5.1 ATEX

The ATEX certification is listed below the following number:

Certificate number: BVS 03 ATEX E 226

5.2 IECEX

The IECEX certification is listed under the following number:

Certificate number: IECEX BVS 11.0058X

You can access all IECEX certificates on the official website of the IEC under their certificate number. <http://iecex.iec.ch/iecex/iecexweb.nsf/welcome?openform>

5.3 PESO



The PESO certification is listed under the following number:

Certificate number:	A/P/HQ/MH/104/3217(P327856)
CCE identification number:	P327856/1

The Falcon devices versions “RS-422” and “A” are licensed under the identification number specified.

The PESO certificate applies both to version “B” and “BM” devices, since the changes made do not affect explosion protection.

6 Marking

Manufacturer		R. STAHL HMI Systems GmbH
Type code		ET-65-B / ET-75-B / ET-125-B / ET-125-BM
CE classification:		 0158
Testing authority and certificate number:		BVS 03 ATEX E 226 IECEX BVS 11.0058X
Ex classification:		
ATEX guideline 94/9/EC		II 2 G Ex ia IIC/IIB T4/T3 Gb II 2 D Ex ia IIIC T70°C/80°C Db
IECEX		Ex ia IIC/IIB T4/T3 Gb Ex ia IIIC T70°C/80°C Db

7 Power supply

Operator interface	Power supply			Current consumption
	Minimum	Nominal voltage	Maximum	Maximum
ET-65-B	8 VDC	10,8 VDC	12,4 VDC	180 mA
ET-75-B				
ET-125-B				
ET-125-BM				
Power supply backlight				
ET-65-B	8 VDC	10,8 VDC	12,4 VDC	140 mA
ET-75-B				
ET-125-B				
ET-125-BM				
Power supply reader unit				
ET-65-B	8 VDC	10,8 VDC	12,4 VDC	180 mA
ET-75-B				
ET-125-B				
ET-125-BM				

8 Permitted maximum values

8.1 Connection X1, supply

Terminals 1 and 2:

Power supply operator interface				
Voltage	U_i	=	12.4	VDC
Current	I_i	=	200	mA
Effective internal capacitance	C_i	=	negligible	
Effective internal inductance	L_i	=	negligible	

Terminals 3 and 4:

Backlight power supply				
Voltage	U_i	=	12.4	VDC
Current	I_i	=	200	mA
Effective internal capacitance	C_i	=	negligible	
Effective internal inductance	L_i	=	negligible	

8.2 Connection X2, communication

Communications interface				
Voltage	U_o	=	5.88	VDC
Current	I_o	=	40	mA
Internal resistance	R_i		147	Ω

For group IIC

Max. external capacitance	C_o	=	43	μF
Max. external inductance	L_o	=	30	mH

The following values apply in the case of combined capacitances and inductances:

Max. external capacitance	C_o	=	2.7	μF
At max. external inductance	L_o	=	1	mH

For group IIB

Max. external capacitance	C_o	=	1000	μF
Max. external inductance	L_o	=	85	mH

The following values apply in the case of combined capacitances and inductances:

Max. external capacitance	C_o	=	15	μF
At max. external inductance	L_o	=	1	mH

For the connection of intrinsically safe circuit with the following maximum value:

Voltage	U_i	=	8	VDC
Effective internal capacitance	C_i	=	negligible	
Effective internal inductance	L_i	=	negligible	

8.3 Connection X5, input

Digital input				
Connection of passive keys / switches, max. 2 m cable				
Voltage	U_o	=	5.88	VDC
Current	I_o	=	40	mA

8.4 Connection X7, readers

Terminals 1 and 2:

Power supply input				
Type RSi1				
Voltage	U_i	=	12.4	VDC
Current	I_i	=	220	mA
Effective internal capacitance	C_i	=	negligible	
Effective internal inductance	L_i	=	negligible	

Terminals 9 and 3:

Output power supply circuit for types WCR1 or RSi1

The values for voltage U_o and power I_o . The power P_o , the maximum external inductance L_o . and the capacitance C_o . depend on the supply to terminals 1 and 2.

Terminals 3 and 4:

Power supply readers				
Terminals 3 and 4 are connected potential together with the terminals 1 and 2.				
Type RSi1				
Voltage	U_o	=	5.4	VDC
Max. current *	I_o	=	220	mA
Internal capacitance	C_i	=	4.2	μF
Internal inductance	L_i	=	100	nH

* I_o depends on the power supply connected to terminals 1 and 2 and cannot exceed the above value.

RSi1:

A current of $I_o = 220$ mA results in the following external values:
For group IIC

Max. external capacitance	C_o	=	60	μF
Max. external inductance	L_o	=	0.1	mH

The following values apply in the case of combined capacitances and inductances:

Max. external capacitance	C_o	=	1.8	μF
At max. external inductance	L_o	=	0.05	mH

For group IIB

Max. external capacitance	C_o	=	1000	μF
Max. external inductance	L_o	=	2	mH

The following values apply in the case of combined capacitances and inductances:

Max. external capacitance	C_o	=	5.1	μF
At max. external inductance	L_o	=	1	mH

Terminals 5 to 8:

Singal input / output			
Type RSi1			
Voltage	$U_o =$	5.4	VDC
Current	$I_o =$	49	mA
Power	$P_o =$	62	mW
Max. external capacitance	$C_o =$	65	μF
Max. external inductance	$L_o =$	14	mH
For the connection of an intrinsically safe circuit with the following maximum value:			
Voltage	$U_o =$	15	VDC
Current	$I_o =$	500	mA
Power	$P_o =$	2.5	W
Effective internal capacitance	$C_o =$	negligible	
Effective internal inductance	$L_o =$	negligible	

9 Ambient temperature range

The ambient temperature range T_a is:

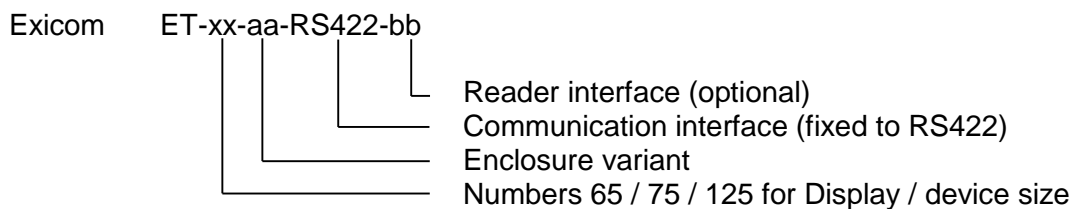
- T4 -20°C to +60°C
- T3 -20°C to +70°C

☞ For functional reasons, the lower temperature stated here differs by 5°C from that stated on the Examination Certificate.
For operation, - 20°C apply !

The maximum surface temperature for the temperature ranges is:

- T4 70°C
- T3 80°C

10 Type code



Product type:

Version	Description
	Type with
ET-xx- B -RS422-bb	Plastic enclosure (PA66)
ET-xx- BM -RS422-bb	Stainless steel enclosure (only ET-125)
ET-xx-aa-RS422- RSi	RSi (Typ RSi1) interface for barcode or transponder reader

11 Safety Advice

This chapter is a summary of the key safety measures. The summary is supplementary to existing rules which staff also have to study.

The safety of persons and equipment in hazardous areas depends on compliance with all relevant safety regulations. Thus, the installation and maintenance staff carry a particular responsibility, requiring precise knowledge of the applicable regulations and conditions.

11.1 Installation and operation

Please note the following when installing and operating the device:

- The advice contained in this instruction manual must be adhered to.
- The national regulations for installation and assembly apply (e.g. IEC/EN 60079-14).
- The operator interfaces may be installed in zones 1, 2, 21 or 22.
- The operator interfaces must be integrated into the system's equipotential bonding.
- The intrinsically safe circuits must be installed according to applicable regulations.
- The operator interface must only be switched on when it is closed.
- When installed in zones 1, 2, 21 and 22, intrinsically safe devices suitable for zones 1, 2, 21 and 22 may be connected to the intrinsically safe power supply circuits.
- The safe maximum values of the connected field device(s) must correspond to the values listed on the data sheet or the EC type examination certificate.
- Interconnecting several active devices in an intrinsically safe circuit may result in different safe maximum values. This could compromise intrinsic safety !
- National safety and accident prevention rules.
- Generally accepted technical rules.
- Safety instructions contained in these operating instructions.

Use the operator interface for its intended purpose only (see "Function").

Incorrect or unauthorized use and non-compliance with the instructions in this manual will void any warranty on our part.

No changes to the operator interface that compromise its explosion protection are permitted !

The operator interface may only be installed and operated in an undamaged, dry and clean condition !



Damage may compromise Ex-protection. In the case of visible damage, the operator interface must be returned to the manufacturer for repair.

11.2 Special conditions

for installation in:

11.2.1 Zone 21

- During assembly and operation of the operator interface electrostatic surface charging must not exceed that caused by manual rubbing.
- If the operator interface is installed in **Zone 21**, the housing must **NOT** be opened in explosive atmosphere.
- If the operator interface is mounted inside a plastic housing of type 8146 by R. STAHL AG, the ambient temperature range is -20°C to $+55^{\circ}\text{C}$.

If you intend to mount the operator interface in a different housing please note the following conditions:

- The housing must be a group IIIC certified housing.
- It must be certified for installation in temperature range $T \geq 70^{\circ}\text{C}$ or $T \geq 80^{\circ}\text{C}$.
- If the housing is **NOT** certified for installation in temperature range $T \geq 70^{\circ}\text{C}$ or $T \geq 80^{\circ}\text{C}$, an individual type plate must be attached to the housing specifying the permitted ambient temperature range for this housing.

11.2.2 Zone 22

- During installation it must be ensured that all seals of the contact surfaces are in order and that at least protection type IP54 according to EN 60529 is achieved after installation.
- All cable glands at the housing have to comply with the requirements of current standards.

12 Installation and operation

12.1 General information

Electrical installations are subject to the relevant regulations for installation and operation, such as RL 1999/92/EC, RL 94/9/EC and IEC/EN 60079-14.

The users of electrical installations in hazardous environments must ensure that the equipment is kept in proper condition, is operated according to instructions and that maintenance and repairs are carried out.

12.2 ET-65-B, ET-75-B, ET-125-B, ET-125-BM

- The operator interfaces may be installed in zones 1, 2 or 21, 22. The intrinsically safe circuits must be installed according to applicable regulations.
- Intrinsically safe and non intrinsically safe conducting connection parts must be installed with a minimum distance of 50 mm.
- The operator interfaces are constructed according to protection type IP65 and must therefore be protected from adverse environmental conditions such as splashed water or dirt exceeding pollution degree 2.
- The EC type examination certificates should be read before installation. Users must adhere to any "special conditions" therein. Also of importance are the permitted electrical operating values specified therein.
- When connecting the operator interfaces to the intrinsically safe circuits of the associated equipment the respective peak values of the field unit and the associated device must be observed to ensure explosion protection (proof of intrinsic safety).
- The I.S. terminals may also with voltage applied.
- The external PA / \perp -connection is subject to installation regulations and may therefore have to be connected to an equipotential bonding system. A connection is provided on the back of the terminal housing for this purpose.
- The PA-connector must be connected to the equipotential bonding conductor of the hazardous area.

When installing the device, particular care shall be taken that:

- the operator interface has been properly installed according to instructions,
- the operator interface is undamaged,
- the terminal compartment is clean,
- all screws are tightened fast,
- where necessary, the device's external bonding terminal is properly connected to the exponential bonding system at its place of use,
- the cover of the terminal compartment is completely closed.

12.3 Only ET-125-BM

- The ET-125-BM with stainless steel housing may be mounted inside an additional, suitable housing of protection type "e" (increased safety) or dust ignition protection type "tD" without these protection types being compromised.

13 Assembly and disassembly

13.1 General information

Assembly and disassembly are subject to general technical rules. Additional, specific safety regulations apply to electronic and pneumatic installations. In Germany, for example, these include the BGI 547 (Information on and principles of workplace safety and health issued by the Government Safety Association) and the BetrSichVer (Betriebssicherheitsverordnung - German Regulation of Workplace Safety).

13.2 Cut-out

Make a cut-out with the following dimensions:

Operator interface	Width	Height	Installation depth	Material thickness
ET-65-B / ET-75-B	275.0 ± 0.5 mm	131.0 ± 0.5 mm	max. 80 mm	up to 10 mm
ET-125-B / ET-125-BM	300.0 ± 0.5 mm	180.0 ± 0.5 mm	max. 80 mm	up to 10 mm

13.3 Assembly of

Mount the device using all fasteners, the fixing frame and the seal provided:

- For operator interfaces ET-65-B and ET-75-B use the type 7 fastener set with 8 fastener brackets and for ET-125-B and ET-125-BM the type 8 fastener set with 10 fastener brackets.
- Fixing frame type 1 is for operator interfaces ET-65-B and ET-75-B and type 2 is for ET-125-B and ET-125-BM.
These fixing frames are used as guides for the fastener brackets and therefore serve to securely and stably position the operator interface.
- Fix the brackets in the corresponding gaps of the housing.

Optimum sealing:

- Tighten the screws lightly.
- Check the position of the display, ensuring above all that the rubber seals are correctly positioned.
- Now tighten the terminal screws with a tightening torque of between 0.3 and 0.4 Nm.

Caution:

IP65 is achieved with

- proper mounting and
- a level and smooth mounting surface

14 Commissioning

14.1 Connections

Terminal	Pin	Definition	Connection
X1	1	Power supply operator interface +12 VDC	Power supply of the operator interface
	2	Power supply operator interface GND 1	
	3	Power supply backlight +12 VDC	
	4	Power supply backlight GND 2	
X2	1	TxD-A	Serial interface RS-422
	2	TxD-B	
	3	RxD-A	
	4	RxD-B	
X5	1	Input 1	Keys or switches *
	2	Input 2	
	3	Input 3	
	4	Input 4	
	5	Input 5	
	6	Input 6	
	7	Input 7	
	8	Input 8	
	9	+ 3.3 VDC	
X7 **	1	Power supply reader module +12 VDC	Card reader ***
	2	Power supply reader module GND 3	
	3	Power supply card reader GND 4	
	4	Power supply card reader +5 VDC	
	5	RxD	
	6	TxD	
	7	RTS	
	8	CTS	
	9	+ 12 VDC (out)	

* The push buttons or keys used here must at least be suitable for $U \geq 6 \text{ V}$ and $I \geq 60 \text{ mA}$. The maximum nominal values are 3.3 V and 2 mA.

** Concerning the X7 reader interface, the actual operator interfaces are different compared to the first certification status !

For operator interfaces under the first certification status, please use the delivered operating instruction or contact our support department.

15 Maintenance, service

Adhere to the applicable directives for the maintenance, service and testing of associated equipment. For explosion-protected devices the directives 1999/92/EC, IEC/EN 60079-14, -17, -19 and BetrSichVer also apply.

Because the transmission of the devices remains reliable and stable over long periods of time, regular adjustments are not required.

- Only original parts provided by the manufacturer must be used.
- Fuses may only be replaced by equivalent fuse types.

System maintenance should focus on the following:

- a. Seal wear
- b. Monitor damage
- c. All screws are tightened fast
- d. All cables and lines are properly connected and undamaged

15.1.1 Servicing

In accordance with IEC/EN 60079-19 and IEC/EN 60079-17, operators of electric plants in hazardous areas are obliged to have them serviced by qualified electricians.

16 Troubleshooting

Devices operated in hazardous areas must not be modified. Repairs may only be carried out by qualified, authorised staff specially trained for this purpose.



Repairs may only be carried out by specially trained staff who are familiar with all basic conditions of the applicable user regulations and – if necessary – have been authorized by the manufacturer.

17 Disposal

Disposal of packaging and used parts is subject to regulations valid in whichever country the device has been installed.

The disposal of devices sold after August 13th, 2005, and installed in countries under the jurisdiction of the EU is governed by directive (amendment) 2012/19/EU on waste electrical and electronic equipment (WEEE). Under this directive, HMI devices are listed in category 9 (monitoring and control instruments).

We shall take back our devices according to our General Terms and Conditions.

17.1 RoHS directive 2011/65/EC

The revised version of the RoHS (restriction of hazardous substances) 2002/95/EC directive, directive 2011/65/EC, extends its area of application to all electric and electronic products.

In the case of HMI devices (category 9 – monitoring and controlling devices) a transitional period applies until 22.07.2017, after which the banned substances listed in RoHS 2011/65/EC directive apply to all devices newly put on the market.

17.1.1 China RoHS

According to a new administrative rule introduced in China 01.03.2007 all devices containing hazardous substances must be labelled accordingly.

The following applies to the Falcon operator interfaces:

Names and Contents of Toxic or Hazardous Substances or Elements

Part Name	Toxic or hazardous Substances and Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexa- valent Chromium (Cr (VI))	Poly- brominated biphenyls (PBB)	Poly- brominated diphenyl ethers (PBDE)
Housing	O	O	O	O	O	O
Display	O	O	O	O	O	O
all PCBs	X	O	O	O	O	O
Misc.	O	O	O	O	O	O

O Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.

18 Proof of intrinsic safety

Proof of intrinsic safety for the connection of Falcon operator interfaces, 9143 power supply and 9185 Fieldbus isolator.

18.1 General information

Proof of intrinsic safety is based on the principles of EN 60079-14 and the standards it refers to. Particular reference is made to Chapter 12 "Additional requirements for the type of protection i-intrinsic safety" in EN 60079-14.

Proof has been drawn up on the basis of conformity certification and the EC type examination certificate in accordance with ATEX directive and the comparison of the safety technical data listed in these documents.

The following EC-type examination certificates were used:

<i>Device</i>		<i>EC type examination certificate</i>
ET-**-B-RS422-***	—	BVS 03 ATEX E 226
9143/10-***-***-*0	—	BVS 05 ATEX E 152 X
		or
		BVS 03 ATEX E 314
9185/1*-4***-10	—	DMT 02 ATEX E 246 X

*1

The testing authority has listed **all** conditions applicable to intrinsic safety in the EC type examination certificates.

If an EC type examination certificate for a device only specifies the input voltage (U_i), for example, intrinsic safety is guaranteed if the associated supply does not exceed this voltage (U_o is less than / equals U_i).

Other output parameters specified in the examination certificate of the power supply (e.g. I_o , P_o) are in this case irrelevant to intrinsic safety.

The values for capacitance and inductance of the cables used is not part of the proof of intrinsic safety and still has to be included in the calculation. The values in the above tables represent the maximum cable capacitance and inductance. These are based on combined capacitances and inductances.

☞ The data given in this document do **NOT** absolve the fitter and/or operator of the systems from their obligation to ensure compliance with legal requirements, directives and regulations. Due diligence remains the sole responsibility of the fitter and/or operator !

18.2 Block diagram with power supply 9143/10-114-200-**

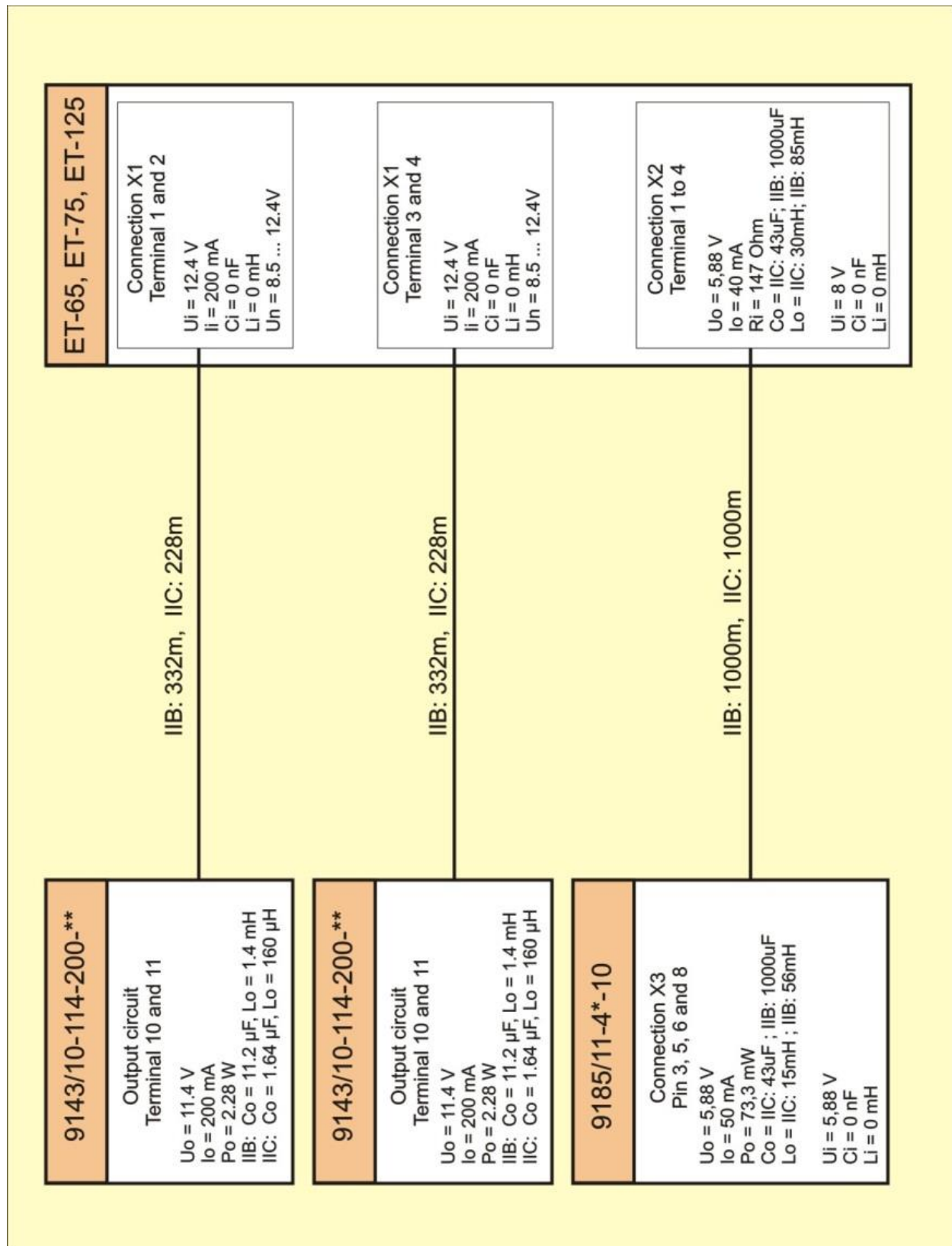


Illustration: **ET-**5** with 9143/10-114-200-** and 9185/11-4*-10 point-to-point operation with approved cable length and prescribed cable type.

18.3 Interconnection

Consideration of voltage, current, capacitance and inductance values of all circuits to determine the connection.

Circuit :

Power supply 9143/10-114-200-*0 → Falcon operator interface supply

Source / active	==>	Acceptor / passive
9143/10-114-200-*0		ET-**-B-RS-422-***
Connection terminals 10 & 11		Connection X1 terminals 1 & 2
$U_o = 11.4VDC$	<	$U_i = 12.4VDC$
$I_o = 200mA$	=	$I_i = 200 mA$
$C_{O_{IIC}} = 1.64 \mu F$		C_i negligible
	=> $C_{cable_{IIC}} \leq 1.64 \mu F$	
$L_{O_{IIC}} = 160 \mu H$		L_i negligible
	=> $L_{cable_{IIC}} \leq 160 \mu H$	
$C_{O_{IIB}} = 11.2 \mu F$		C_i negligible
	=> $C_{cable_{IIC}} \leq 11.2 \mu F$	
$L_{O_{IIB}} = 1.4 mH$		L_i negligible
	=> $L_{cable_{IIB}} \leq 1.4 mH$	

Circuit :

Power supply 9143/10-114-200-*0 → Falcon operator interface backlight

Source / active	==>	Acceptor / passive
9143/10-114-200-*0		ET-**-B-RS-422-***
Connection terminals 10 & 11		Connection X1 terminals 3 & 4
$U_o = 11.4VDC$	<	$U_i = 12.4VDC$
$I_o = 200mA$	=	$I_i = 200 mA$
$C_{O_{IIC}} = 1.64 \mu F$		C_i negligible
	=> $C_{cable_{IIC}} \leq 1.64 \mu F$	
$L_{O_{IIC}} = 160 \mu H$		L_i negligible
	=> $L_{cable_{IIC}} \leq 160 \mu H$	
$C_{O_{IIB}} = 11.2 \mu F$		C_i negligible
	=> $C_{cable_{IIC}} \leq 11.2 \mu F$	
$L_{O_{IIB}} = 1.4 mH$		L_i negligible
	=> $L_{cable_{IIB}} \leq 1.4 mH$	

Circuit :

Falcon operator interface communication → Fieldbus isolator 9185/11-4***-10

a) ET... operator interface active (transmission cables v. operator interface)

Source / active	==>	Acceptor / passive
ET-**-B-RS-422-***		9185/11-4***-10
Connection X2 terminals 3 & 4		Connection X3 Pin 8 & 3
U _o = 5.88VDC	=	for the connection of intrinsically safe Fieldbus circuits with the following maximum value: U = +/-5.88 V (see *1)
C _{O_{IIC}} = 43 μF		C _i negligible
	=> C cable _{IIC} ≤ 43 μF	
L _{O_{IIC}} = 30 mH		L _i negligible
	=> L cable _{IIC} ≤ 30 μH	
C _{O_{IIB}} = 1000 μF		C _i negligible
	=> C cable _{IIB} ≤ 1000μF	
L _{O_{IIB}} = 85 mH		L _i negligible
	=> L cable _{IIB} ≤ 85 mH	

Circuit :

Fieldbus isolator 9185/11-4***-10 → Falcon operator interface communication

b) Fieldbus isolator 9185... active (receiving cables v. operator interface)

Source / active	==>	Acceptor / passive
9185/11-4*-10		ET-**-B-RS-422-***
Connection X3 Pin 9 & 4		Connection X2 terminals 1 & 2
U _o = 5.88 V	<	for the connection of intrinsically safe Fieldbus circuit with the following maximum value: U = 8 VDC (see *1)
C _{O_{IIC}} = 43 μF		C _i negligible
	=> C cable _{IIC} ≤ 43 μF	
L _{O_{IIC}} = 15 mH		L _i negligible
	=> L cable _{IIC} ≤ 15 μH	
C _{O_{IIB}} = 1000 μF		C _i negligible
	=> C cable _{IIB} ≤ 1000μF	
L _{O_{IIB}} = 56 mH		L _i negligible
	=> L cable _{IIB} ≤ 58 mH	

If the inductance and capacitance values of the cables are not exceeded the components may be connected.

18.4 Example calculation of cable length

Cable values

The values of the cables recommended by us - LiYCY n x 2 x 0.75 / 77 blue - (n = number of cable pairs) are:

Inductance (wire/wire)	L_k	0.7 mH/km
Capacitance (wire/wire + 0.5*wire/screen)	C_k	165 pF/m
Wire resistance	R_k	25 Ω /km

Formula for cable length calculation

dependent on external inductance: $\text{Length}_L = (L_o - L_i) / L_k$

dependent one external capacitance: $\text{Length}_C = (C_o - C_i) / C_k$

dependent on cable resistance: $\text{Length}_R = R_o / (2 * R_k)$

L_o maximum inductance to be connected to the signal circuit of the equipment or associated equipment (Ex)

L_i internal inductance of a signal circuit of the equipment or associated equipment

C_o maximum capacitance to be connected to the signal circuit of the equipment or associated equipment Ex)

C_i internal capacitance of a signal circuit of the equipment or associated equipment

R_o maximum conductor resistance to be connected to the signal circuit of the equipment or associated equipment (functional)

☞ In addition to requirements made by explosion protection considerations (max. inductance and capacitance), some cases also have functional limitations that need to be considered.

Cable length for circuits for supply and backlight

(Example below calculated using the values of the 9143/10-114-200-** power supply)

between	
type 9143/10-114-200-** power supply	terminals 10, 11
and	
Falcon operator interface	connection X1, terminals 1 and 2 (supply)
and	
Falcon operator interface	connection X1, terminals 3 and 4 (backlight)

Circuit values

	9143/10-114-200-** terminals 10, 11	ET-FALCON X1, terminal 1 and 2 X1, terminal 3 and 4
U _o	11.4 V	---
I _o	200 mA	---
P _o	2.28 W	---
C _o	IIB: 11.2 µF IIC: 1.64 µF	---
L _o	IIB: 1.4 mH IIC: 160 µH	---
U _i	---	12.4 V
U _{min}	10.5 V	7.5 V
I _i	---	200 mA
I _{enn}		180 mA
C _i	---	0 nF
L _i	---	0 µH

Determination of cable length for gas group IIC

Values			Calculated length (acc.to formula)	Established length = minimum calculated length
L _o	L _k	L _i	228 m	228 m (IIC) (Limitation due to Ex parameters)
160 µH	0.7 mH/km	0 µH		
C _o	C _k	C _i	9939 m	
1.64 µF	165 pF/m	0 µF		
R _o	R _k	R _i	332 m	
16.6 Ω*	25 Ω/km	0 Ω		

Determination of cable lengths for gas group IIB

Values			Calculated length (acc.to formula)	Established length = minimum calculated length
L _o	L _k	L _i	2000 m	332 m (IIB) (Limitation of functional nature)
1.4mH	0.7 mH/km	0 µH		
C _o	C _k	C _i	67878 m	
11.2 µF	165 pF/m	0 µF		
R _o	R _k	R _i	332 m	
16.6 Ω*	25 Ω/km	0 Ω		

* R_o is the result of $[U_{min}(9143) - U_{min}(ET-xx)] / I_{enn}(ET-xx)$
 $= [10.5 V - 7.5 V] / 180 mA$
 $= 16.6 \Omega$

Cable lengths for data transmission circuit (point-to-point operation)

between
 Fieldbus isolator type 9185/11-4*-10 pins 3, 5, 6 and 8
 and
 Falcon operator interface connection X2, terminals 1 to 4

Circuit values

	9185/11-4*-10 pins 3, 5, 6 and 8	ET-FALCON X2, terminals 1 to 4
Uo	5.88 V	5.88 V
Io	50 mA	40 mA
Po	73.3 mW	58.8 mW
Ri	117 Ω	147 Ω
Co	IIB: 1000 μF IIC: 43 μF	IIB: 1000 μF IIC: 43 μF
Lo	IIB: 56 mH IIC: 15 mH	IIB: 85 mH IIC: 30 mH
Ui	5.88 V	8 V
Ii	no restriction	no restriction
Ci	0 nF	0 nF
Li	0 μH	0 μH

☞ The Li data can be ignored as this current is automatically set by the internal circuit (resistor combination) of the 9185/11-4*-10. The limit here is determined by voltage Ui of the 9185/11-4*-10, which is 5.88 V.

Determination of cable length for gas group IIC

Values			Calculated length (acc.to formula)	Established length	
9185/11-4*-10 (active) – ET-FALCON (passive)					
Lo	L _k	Li	21428 m	1000 m (IIC) *	
15 mH	0.7 mH/km	0 μH			
Co	C _k	Ci	260606 m		
43 μF	165 pF/m	0 μF			
9185/11-4*-10 (passive) – ET-FALCON (active)					
Lo	L _k	Li	42857 m		
30 mH	0.7 mH/km	0 μH			
Co	C _k	Ci	260606 m		
43 μF	165 pF/m	0 μF			

Determination of cable lengths for gas group IIB


Values			Calculated length (acc.to formula)	Established length	
9185/11-4*-10 (active) – ET-FALCON (passive)					
Lo	L _k	Li	80000 m	1000 m (IIB) *	
56 mH	0.7 mH/km	0 μH			
Co	C _k	Ci	6*10 ⁶ m		
1000 μF	165 pF/m	0 μF			
9185/11-4*-10 (passive) – ET-FALCON (active)					
Lo	L _k	Li	121428 m		
85 mH	0.7 mH/km	0 μH			
Co	C _k	Ci	6*10 ⁶ m		
1000 μF	165 pF/m	0 μF			

* maximum technical length is 1000m (Limitation of functional nature)

19 I.S. power supply 9143

19.1 Function

The I.S. power supplies are used to provide intrinsically safe power to the operator interfaces and their accessories.

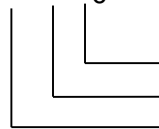
 For information relevant to explosion protection and general safety, for technical data, the EC type examination certificate and the declaration of conformity please refer to the Operating Instructions of the 9143 power supply.

19.2 Type code

Type code:

Power supply

9143/10-***-***-*0



Auxiliary power supply
Value for power output I.S.
Value for voltage output I.S.

Product type:

Type	Auxiliary power supply
Power supply 9143/10-114-200-10	24 VAC / VDC
Power supply 9143/10-114-200-20	85...230 VAC

19.3 Mounting

Mounting position: any

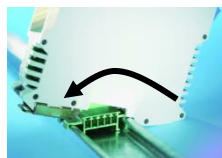
a) Detachable terminals

All devices are fitted with detachable terminals. The terminals can be detached by means of a screwdriver, for example.



b) Mounting on DIN rails in accordance with EN 50022

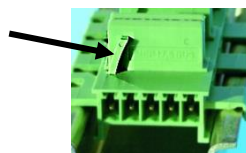
Place the device on the DIN rail and tilt/snap onto the rail as shown below. Do not tilt to either side when mounting. To dismount, gently loosen the lock on the mounting foot with a screwdriver and then remove the module.



c) Mounting on DIN rails with a pac-bus already installed (only 9143/10-...-...-10)

As shown below, place the device on the pac-Bus and tilt/snap until it locks in. Do not tilt to either side when mounting.



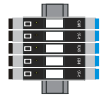


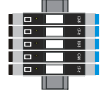
Note: In order to prevent pole reversal during installation, the pac-Bus elements are fitted with a polarisation guide (see below) and the module is fitted with a matching slot.



Dismount as described in section b) above.

19.3.1 Maximum permitted ambient temperatures

Devices of the IS pac series can be operated inside a wide range of temperatures. The maximum permitted ambient temperature may vary depending on device type and installation conditions.

	Mounting position:	DIN rail	max. temperature
without circulation	<u>One device:</u> horizontal vertical		70 60
	horizontal		70
	vertical		60
with circulation	<u>One device:</u> horizontal vertical		70
	horizontal		70
	vertical		

19.3.2 Projection of dissipation loss in control cabinets

Installing operator interfaces in control cabinets limits the free circulation of air, and the temperature will rise. To minimize this temperature rise it is important to optimize the dissipation loss as well as the heat generated inside the cabinet.

a) Natural convection in closed cabinets

- Application: in case of little dissipation loss and when the system is installed in a dusty or rough environment
- Calculation of the maximum permitted dissipation loss:

$$P_{\max} = \Delta t * S * K$$

P_{\max} [W] maximum permitted dissipation loss inside the control cabinet

Δt [°C] maximum permitted temperature increase

S [m²] free, heat-emitting surface of the control cabinet

K [(W/m²*°C)] thermic conductance coefficient (coated steel: $K = 5.5$)

The calculated value P_{\max} must be less than the sum of the average dissipation loss (70% of the maximum dissipation loss) of the installed devices: $P_{\max} < \sum P_{70\%}$

b) Natural convection in open cabinets

- Function: the heat is displaced by cool airstreams between the devices
- Conditions:
 - Air inlets and outlets at the top and bottom of the cabinet
 - the airstream path must be free of obstacles
- Result: Depending on the actual set-up, twice the permitted dissipation loss as that under a) can be achieved.

c) Forced ventilation with heat exchanger in closed cabinets

- Application: when neither the environment or the high dissipation loss allow for natural convection
- Function: a heat exchanger with a fan draws air into the cabinet and presses it into the heat exchanger plates, which are cooled with ambient air by a second fan.
- Result: Depending on the actual set-up, **5 to 6 times** the permitted dissipation loss as that under a) can be achieved.

d) Forced ventilation in open cabinets

- Function: One or more fan/s generate an airstream from the opening at the bottom of the cabinet past the devices and out of the upper opening of the cabinet.
- Calculation of the required airstream:

$$Q = (3,1 * P_{70\%}) / \Delta t$$

Q [m³/h] required airstream

P_{\max} [W] developing dissipation loss (70% of the maximum dissipation loss)

Δt [°C] permitted temperature increase in the control cabinet

e) Air conditioner

- Application: in hot climates – it is possible to achieve a temperature inside the cabinet that is the same or less than the ambient temperature.
- Function: Use of a specific chilling system or the existing air conditioning system to cool the cabinet.

19.4 Connections 9143

Power supply 9143/10-***-***-10			
Input		Output (intrinsically safe)	
Connection (pin)	Definition	Connection (pin)	Definition
Connector			
7	+ 24V DC	10	Output 1+
8	Functional earth	11	Output 1-
9	GND	12	N.C. **
Pac Bus			
1	+ 24V DC		
2	GND		
3, 4	LF *		
5, 6	N.C. **		

* Contacts 3 and 4 (LF) on the pac bus must be short-circuited !

Power supply 9143/10-***-***-20			
Input		Output (intrinsically safe)	
Connection (pin)	Definition	Connection (pin)	Definition
Connector			
7	85...230 V AC	10	Output 1+
8	Functional earth	11	Output 1-
9	85...230 V AC	12	N.C. **

** Not connected

20 Fieldbus Isolator 9185

20.1 Function

The 9185/11 Fieldbus-Isolator is used to isolate the intrinsically safe RS-422 interface of the operator interfaces from non-intrinsically safe RS-232, RS-422 or RS-485 interfaces.

The 9185/11 Fieldbus-Isolator can also be used to transform different types of interfaces.

For information relevant to explosion protection and general safety, for technical data, the EC type examination certificate and the declaration of conformity please refer to the Operating Instructions of the 9185/11 Fieldbus Isolator.

20.2 Mounting

As described above in section 19.3.

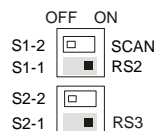
20.3 Connections

9185/11-45-10	
Connection (pin)	Definition
X1 RS-232 (non Ex-side)	
2	RxD
3	TxD
5	GND
7	RTS
8	CTS
X2 RS-422 (non Ex-side)	
8	TxD-A
3	TxD-B
9	RxD-A
4	RxD-B
X2 RS-485 (non Ex-side)	
8	A (-)
3	B (+)
X3 RS-422 (Ex-side)	
8	TxD-A
3	TxD-B
9	RxD-A
4	RxD-B
Auxiliary power	
Pac Bus	
1	+ 24V DC
2	GND
3, 4	LF *
5, 6	N.C. **
Terminals	
7	U+ (+24V DC)
8	PE
9	U- (0V) (GND)

20.3.1 Dip switch settings S1 and S2

Switch	Abbreviation (front plate)	Position	Function
S1-1	RS2	ON	RS-422 on the non Ex-side
		OFF	RS-485 on the non Ex-side
S1-2	SCAN	ON	If S1-1 = ON (RS-422): Transmitter RS-422 = scanning
			If S1-1 = OFF (RS-485): Transmitter RS-422 = constantly on
		OFF	If S1-1 = ON (RS-422): RS-485 = bidirectional
			If S1-1 = OFF (RS-485): Transmitter RS-485 = switched off
S2-1	RS3	ON	RS-422 on Ex-side (field side)
		OFF	RS-485 on Ex-side (field side)
S2-2	-	-	Not Connected

- The default setting is:
 S1-2 = OFF
 S1-1 = ON
 S2-2 = OFF
 S2-1 = ON



20.3.2 Rotary encoder switch settings

Rotary encoder switch *	
Switch setting	Baud rate
1	1.2 K
2	2.4 K
3	4.8 K
4	9.6 K
5	19.2 K
8	57.6 K

* Any other switch settings are not valid for the operator interfaces !

20.3.3 Status LEDs

LED	Abbreviation (front plate)	Colour	Definition
1	PWR	green	Power supply OK
2	ERR	red	LED static on = short circuit
			LED flashing = baud rate search in automatic baud rate detection
3	RxD1	green	Reception at the RS-232 interface X1
4	RxD2	green	Reception at the RS-422/485 interface, non Ex-side X2
5	RxD3	green	Reception at the RS-422/485 interface, field side X3

21 Declaration of EC conformity

EG/EU-Konformitätserklärung
EC/EU Declaration of Conformity
Déclaration de Conformité CE/UE



R. STAHL HMI Systems GmbH • Adolf-Grimme-Allee 8 • 50829 Köln, Germany

erklärt in alleiniger Verantwortung, *declares in its sole responsibility, déclare sous sa seule responsabilité,*

dass das Produkt:

that the product:

que le produit:

Bedien- und Beobachtungsgeräte

Operating and Monitoring Devices

Consoles de commande et de visualisation

Typ(en), type(s), type(s):

ET-65 / -75 / -125-B-RS422-***

ET-65 / -75 / -125-BM-RS422-***

***=any character, without relevance for explosion protection

mit den Anforderungen der folgenden Richtlinien und Normen übereinstimmt.

is in conformity with the requirements of the following directives and standards.

est conforme aux exigences des directives et des normes suivantes.

Richtlinie(n) / Directive(s) / Directive(s)			Norm(en) / Standard(s) / Norme(s)
Bis/Until/Jusque'au 2016-04-19:		Ab/From/De 2016-04-20:	EN 60079-0: 2012 EN 60079-11: 2012
94/9/EG	ATEX-Richtlinie	2014/34/EU	
<i>94/9/EC</i>	<i>ATEX Directive</i>	<i>2014/34/EU</i>	
<i>94/9/CE</i>	<i>Directive ATEX</i>	<i>2014/34/UE</i>	

Kennzeichnung, marking, marquage:



II 2 G Ex ia IIC/IIB T4/T3 Gb

II 2 D Ex ia IIIC T70°C/80°C Db

CE 0158

EG/EU-Baumusterprüfbescheinigung:

EC/EU Type Examination Certificate:

Attestation d'examen CE/UE de type:

BVS 03 ATEX E 226

DEKRA EXAM GmbH (NB 0158)

Dinnendahlstraße 9, 44809 Bochum, Germany

Bis/Until/Jusque'au 2016-04-19:		Ab/From/De 2016-04-20:	EN 61000-6-2: 2006 EN 61000-6-4: 2007 + A1:2011
2004/108/EG	EMV-Richtlinie	2014/30/EU	
<i>2004/108/EC</i>	<i>EMC Directive</i>	<i>2014/30/EU</i>	
<i>2004/108/CE</i>	<i>Directive CEM</i>	<i>2014/30/UE</i>	

Produktnormen nach RoHS-Richtlinie (2011/65/EU):

Product standards according to RoHS Directive:

Normes des produit pour la Directive RoHS:

EN 50581:2012

Köln, 2015-12-11

Ort und Datum
Place and date
Lieu et date

i.V.

J. Düren
Technical Director

i.V.

W. Bertges
Quality Manager

22 Release Notes

The chapter entitled "Release Notes" contains all the changes made in every version of the Operating Instructions.

Version 02.05.00

- Creation of Operating Instructions for series Falcon according to 5th supplement
- Addition of disclaimer
- Adaption version of document according to 5th supplement
- Changings in preface
- Adaption of technical data
- Adaption conformity to standards
- Removal of all information according to WCR, because of discontinuing
- Update of safety advice
- Rearranging of chapter and sections
- Implementing of declaration of EC conformity

Version 02.05.01

- Addition of PESO certification
- Deleting of section "documentation produced with due care" and "not accept liability for any mistakes"
- Deleting of sentence "in case of any discrepancies the original EC certificate applies"
- Deleting of section "installation in housings type of protection "e" or "t"
- Addition of new section "only ET-125-BM" in section "Installation and operation"
- Layout and text corrections

Version 02.05.02

- Using of new name "device platform"
- Changing of address and phone numbers
- Adaption of Conformity to standards
- Renew Declaration of EC conformity
- Adaptation section "Disposal" according to the newest WEEE and RoHS directive
- Adaptation section "Proof of intrinsic safety" according to the newest directives
- Text-, layout- and formal corrections

R. STAHL HMI Systems GmbH
Adolf-Grimme-Allee 8
D 50829 Köln

Phone: (switchboard) +49 (0) 221 76 806 - 1000
(Hotline) - 5000

Fax: - 4100

E-mail: (switchboard) office@stahl-hmi.de
(hotline) support@stahl-hmi.de

www.stahl.de
www.stahl-hmi.de

